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Feature Reports

News and Market Reports

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The Iron Age

JUNE 20, 1940

ESTABLISHED 1855

Plain Talk . . .

IN a time of national emergency, it becomes the duty of industry to bend every effort toward the fulfilling of the common need. Today, that need is the defensive armament of the United States.

There is no question as to the loyal response of our industry to that need. And by "industry," I mean its labor, its management and its capital.

Our industries are alive to their responsibilities. I do not know of a single company in the metal-working industry that *wants* to go into the business of making munitions; nor do I, by the same token, know of a single one that will not tackle its assigned job of making munitions with an enthusiasm and singleness of purpose that will far transcend the tempo of normal activities.

Industry knows that it will not profit from this emergency and it does not want to. It knows that, on the contrary, it will have to pay the lion's share of the bill through greatly increased taxes on whatever it may earn in future peace time years. And here again, I include labor, management and capital, as each of these components of industry will have to foot his share of the bill.

Industry (and in speaking of one of its principal sections, I know that I am correctly interpreting all industry) is prepared to "go the limit" to put into successful performance any emergency duty that is laid before it. If there are bottlenecks in equipment, industry will abolish them. If there are "fifth columnists" to hinder progress, industry will eliminate them. If there are men in executive positions incapable of rising to the needs of the times, industry will replace them with capable men with records for performance.

So much for industry and its cooperation with Government. Government can depend on industry. Can industry depend on Government?

It is the major responsibility of the Administration in Washington to make industry,—again in the collective sense—feel that it can. That's point number one.

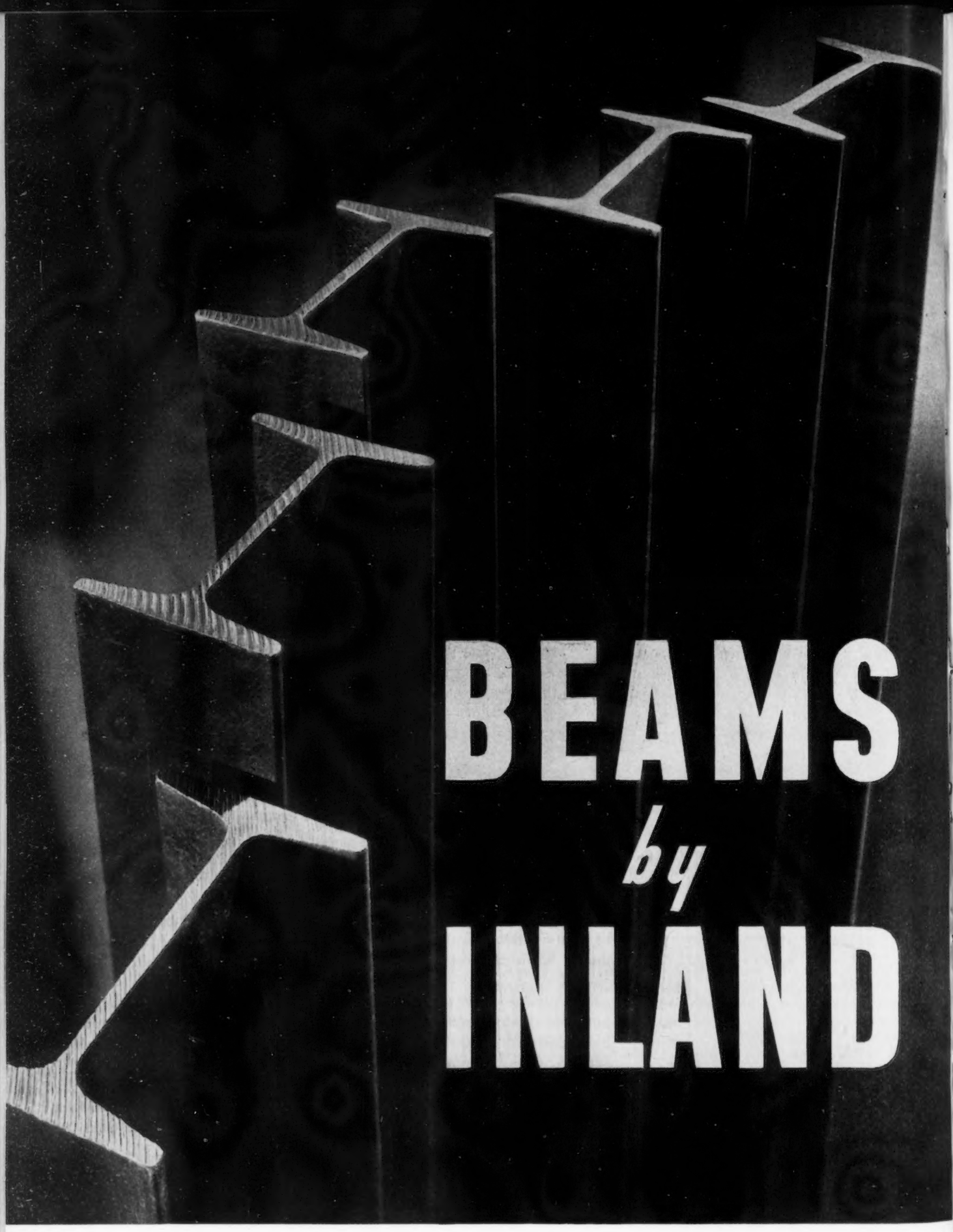
The Administration can have no doubt of the ability of a Knudsen or a Hillman or of the capability of a Ford or 10,000 other industrialists.

Can industry place the same confidence in a Madam Perkins, or a Secretary of the Navy who wants to give up his job to run for Congress, or of a Secretary of Commerce who has spent most of his time on sick leave? Or of a Secretary of War who is content merely to draw a paycheck?

A preparedness program, like war itself, calls for the best minds and hands in the top administrative jobs in Government. Hitler's success has been due to the fact that he had a program, put his most qualified men in charge of it and stuck to it for 10 years.

These are plain and perhaps unpleasant facts, but they are in the minds of labor, of management and of capital today. Today is no time for the protection of political friends. We need the best we have from top to bottom.

J. H. Van Deventer



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Spotwelding Machine Settings

—And Their Effect on Weld Strength

By A. M. UNGER

Welding Engineer, Pullman-Standard Car Mfg. Co., Chicago

WHEN first spotwelding a new job, the question arises: What machine setting should be used? Some years ago, when spotwelders did not have automatic controls and the material being welded was mild steel, and before spotwelding was used in structures, this question was answered by the man operating the machine. Today, with spotwelding being used in structures, the strength of the weld is an important factor; therefore that same question is answered by a competent welding engineer. There can be no guesswork—the answer must be correct.

There are four essential settings that must be made on a spotwelding machine each time a new job is started. These are:

(1) Current strength.

(2) Electrode pressure.

(3) Time of duration of welding current.

(4) Size and shape of electrode tip.

CURRENT STRENGTH: The welding current in a spotwelding machine is measured in thousands of amperes. It usually extends from 5000 to 50,000 amperes. The lower currents are used for light gage steel, and the higher currents for heavier gages of steel and for metals having high conductivity, such as aluminum. The welding current used is adjustable and is set by means of a tap changer on the welding transformer (Fig. 1) or by means of a phase shift dial on an electronic control (Fig. 2). The tap changer alters the turn ratio on the welding transformer, thereby changing the welding current. The phase shift dial on the electronic control varies the percentage of time during each cycle of alternating current that the power tubes are conducting current to the welding transformer. The heat produced in the weld is thereby varied. The advantage of the phase shift control is that, whereas the tap changer gives only definite steps, the phase shift control will give an infinite number of settings from zero to maximum. Best results are obtained in using a combination of the two, the approximate setting being made with the tap changer and the final adjustment by means of the phase shift control.

ELECTRODE PRESSURE is obtained by air or hydraulic cylinders or by springs on mechanically operated machines. Electrode pressure is varied on the air and hydraulic machines by adjusting the unit pressure applied to the piston, which is usually done by means of a regulator in the supply line. On the mechanically operated machines, the electrode pressure is adjusted by varying the initial compression of the spring. The electrode pressure can be varied between wider limits with the air or hydraulic machines than with spring-operated machines.

THE TIME OF DURATION OF WELDING CURRENT is controlled by means of an electronic or mechanical timer. The old-style foot-operated machine had no arrangement for the control of the length of time the current was applied. It was entirely left to the judgment of the operator and consequently varied. In order to obtain consistent and satisfactory results, it is essential that the time be definitely controlled. Fig. 3 illustrates an electronic timer used to control the duration of the welding current, and it is this type of timer that gives the most consistent and satisfactory results. The length of time for current application is definite and the current is always applied at the same point in the voltage wave, thereby eliminating the variable effect of current transients on welding heat. This type of timing con-

trol also permits use of the phase shift heat control adjustment (Fig. 2).

SIZE AND SHAPE OF ELECTRODE TIP: The *size of spot* is controlled by the size and shape of the electrode tip. Various sizes and shapes can be used to produce the desired results. Fig. 4 shows a typical electrode tip. In order that the size of tip may remain constant, a hard copper alloy of good conductivity is used. The tips are machined and changed frequently so that they cannot mushroom excessively and upset the setting of the machine by reducing the current density in the weld.

Variations in Each Setting

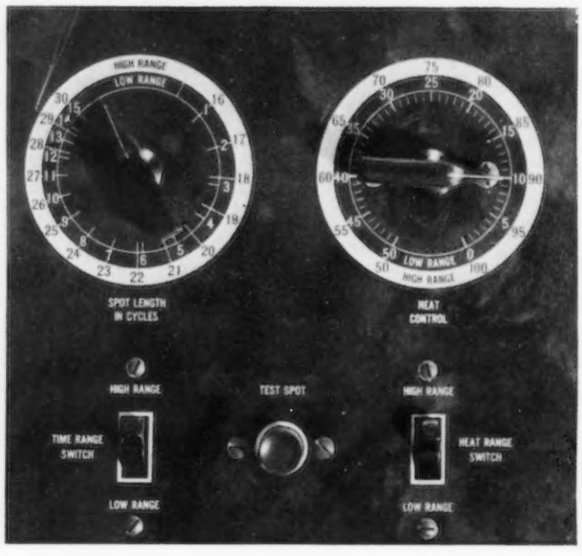
VARIATION IN CURRENT STRENGTH: The effect of current variation on the strength of the weld is shown on the curve in Fig. 5. This curve shows how the shearing strength of the weld varies as the current is increased from zero to the point where it begins to damage the steel. The curve begins at point A, which is the value of current that will produce enough heat to raise the contacting surface of the two sheets to a plastic temperature plus the heat that is being lost by conduction and radiation. Portion AB of the curve has a very steep slope. The spot underneath the electrode reaches a welding temperature practically simultaneously over the entire area. This causes a sudden jump from no weld at all to a strong weld. Very erratic results are obtained with current values from A to B on the curve. Slight variations in electrical contact resistance between sheets and between electrodes and sheets will cause large variations in the results on this part of the curve. From B to C the strength increases in the form of a parabola. The spot is growing larger on the contact surface of the two sheets, exceeding the size of the electrode tip. As the area is proportional to the square of the diameter, the strength of the weld also increases as the square. When point C is reached, several factors act to decrease the strength. Shrink holes or cracks are produced, and the spot is weakened by deep indentation. The portion between B and C is the welding range. The machine should be set a little below C. This will give the highest strength spot and will allow the electrodes to mushroom some without decreasing the current density below point B.

The curve shown in Fig. 5 represents conditions for sheet thickness of 3/32 in. or more. For 1/16 in. thickness or less, the curve takes a different shape, which is shown in Fig. 6; and it will be noted that in this case the strength of the spotweld does not increase materially with higher currents. In the heavier sheets the current has an opportunity to spread more because of the greater distance it travels through the sheet, thereby heating a larger area. The pressure is also distributed over a larger area because of the increased stiffness of the heavier sheet, and therefore the spot can grow in size as the heat is increased by raising the current. In the thinner sheets the current and pressure are more concentrated because the sheet is more easily deformed, and the weld does not grow appreciably in size as the current is increased.

In making a setting for current it is essential to have a tensile testing machine available so that standard shear tests can be made of the spotwelds. The shear test consists of a single spotweld in two overlapping strips. A shear sample is shown in Fig. 7. The free ends of the two strips are gripped in the jaws of the testing machine and the load required to shear the specimen is ascertained.

The proper point for current setting between the two values, B and C on curves in Figs. 5 and 6, can be determined by the use of this tensile testing machine and an etch test. The etch test consists of cutting a cross-section through the weld, polishing and etching it to determine the penetration. Too little penetration means that the setting is near point B on the current variation curve. The results may be very erratic by falling on portion A to B of the curve. The current should be increased to move nearer C. Etching is especially important when welding stainless or aluminum alloys. The penetration of the spotweld should not extend to the surface; otherwise the corrosion-resistance properties of the weld will be impaired.

VARIATION OF ELECTRODE PRESSURE: Fig. 8 shows a typical curve for effect on strength of the weld with variable electrode pressures. With low electrode pressures (less than value X on the curve) no weld at all is obtained. The heat developed melts the metal at the contacting surfaces, and it is blown out by magnetic force and by the pressure of the volatilized metal. Holes are formed in the two pieces and in the electrode tips. With pres-



ABOVE
FIG. 1—Tap changer for adjusting welding current.

° ° °

AT LEFT
FIG. 2—Phase shift control of heat.

sures from X to Y, very erratic results are obtained. The welds are porous and trouble from sticking of the electrode is experienced. The pressure is insufficient to bring the area beneath the electrode tips into intimate contact.

The value of the electrode pressure required depends upon the kind of material, thickness, and shape of the piece being welded. Two flat strips are more easily brought into intimate contact than two angles. Electrode pressures above point Y are in the stable operating range, and slight variations in pressure will not produce such erratic results. At point Z the maximum strength is obtained. With increasing pressures, the electrical contact resistance of the weld is reduced, correspondingly reducing the heat and thereby the size of the weld produced. The value of the electrode pressure that should be used is the value corresponding to point Z on the curve. This is easily determined experimentally by making tests at various pressures and judging by the strength of the spot produced. As the electrode pressure is gradually increased, the various points shown on the curve will be noticed. Point Z is located by the size of the spot. As the electrode pressure is increased and the size and strength of the spotwelds just begin to decrease, point Z has been reached. No specific value for the proper electrode pressure can be stated for a given material of a specified thickness as such value will vary with the conditions of the setup, particularly with the shape of the piece; however it will usually fall within a certain range.

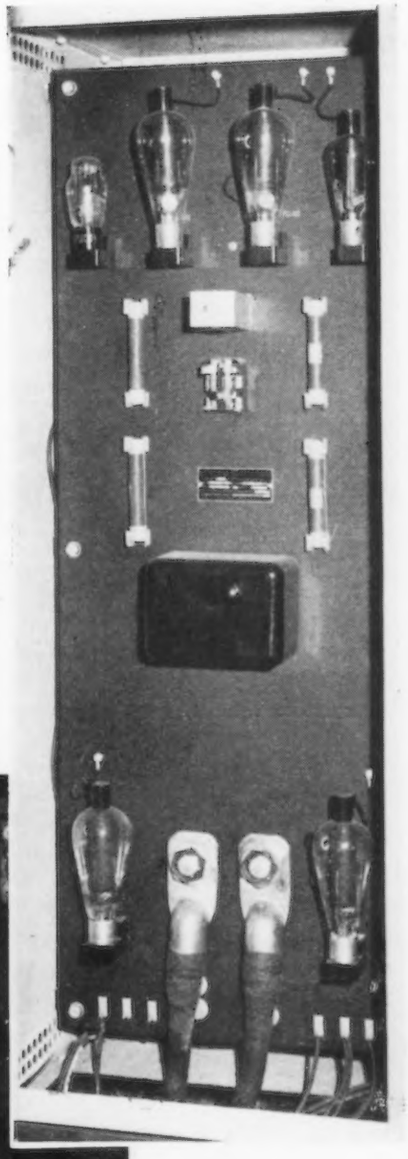


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FIG. 3—Electronic timer used to control the duration of welding current.

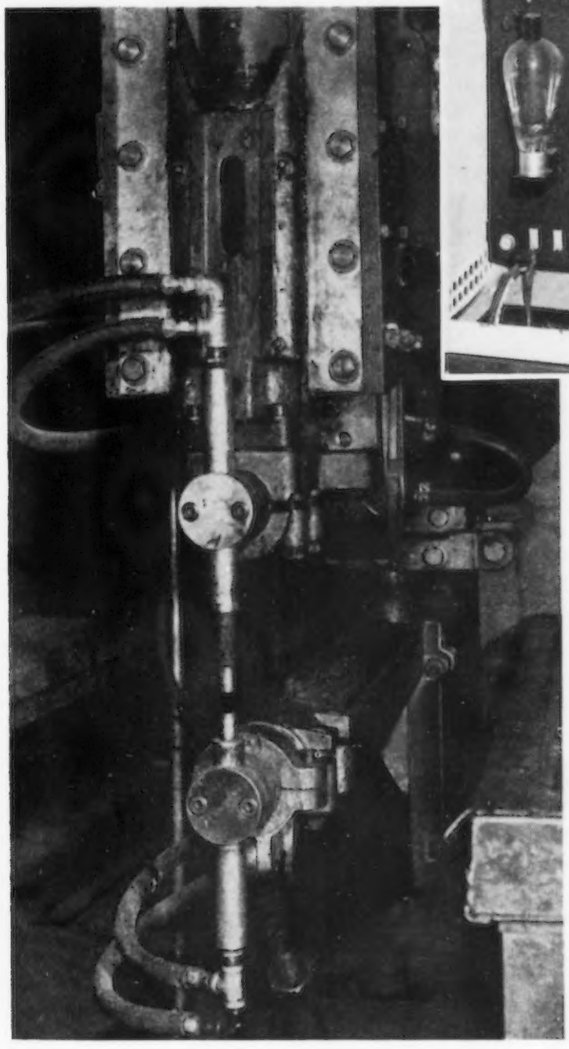

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FIG. 4—Typical electrode tip.

VARIATION IN TIME OF DURATION OF WELDING CURRENT: Time of the weld is defined as the length of time the welding current is on. There are several factors to consider when deciding what time to use in making a weld:

(1) Appearance of weld.
(2) Hardness of weld.
(3) Corrosion-resisting qualities.
(4) Uniformity.
(5) Buckling.

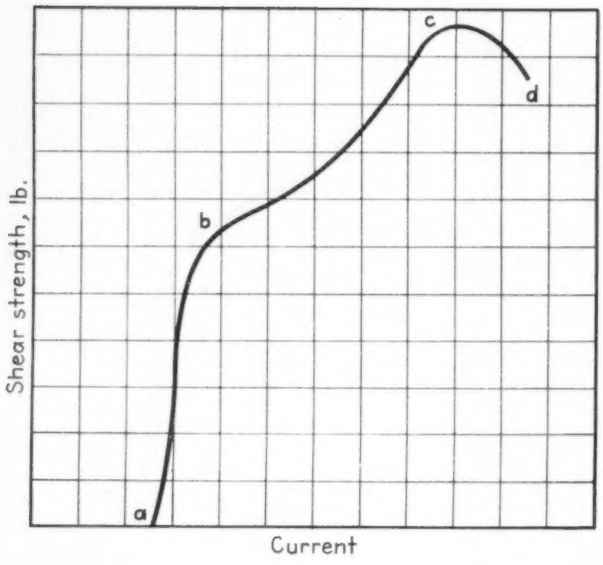
It will generally be found true that on thin sheets the best appearing weld can be made with a short time, and on heavy thicknesses longer times give the best appearance. With thin sheets the heat is very well concentrated underneath the electrode, and longer times only produce deeper indentations and upset more of the metal surrounding the spotweld. On heavier sheets the current spreads out more as it reaches the junction between the two sheets. With too short a timing, the heat is concentrated underneath the electrode tip, which, because of excessive heat at this point, results in the spitting of metal and in deep indentations.

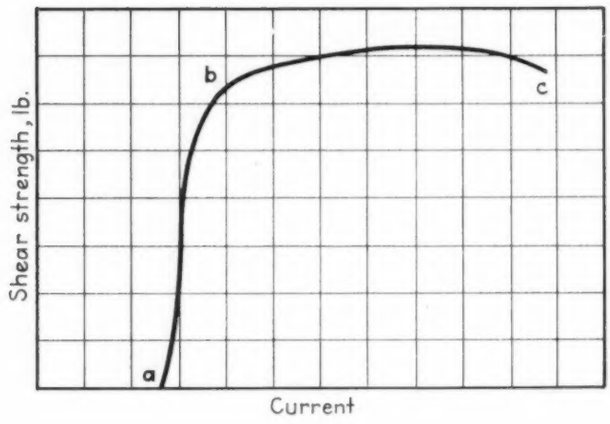
The kind of material being welded will largely determine the timing of the weld. If the material tends to anneal, as is the case with the 18-8 stainless steel, it is necessary to use shorter times for the weld. If the material tends to harden due to the drastic quench it receives in a spotweld, as for example higher carbon steel, longer timing is advisable.

When corrosion is a problem, as when welding 18-8 stainless, it is advisable to use shorter times to prevent carbide precipitation.

Longer timing will tend to give more uniformity, as will be shown later. When buckling or warping is a factor, shorter timing is an advantage.

VARIATION IN SIZE AND SHAPE OF ELECTRODE TIP: Uniform and satisfactory results are maintained by keeping the size and shape of the electrode





ABOVE

FIG. 6—Typical curve showing effect of current variation. For material 1/16 in. thick.

o o o

AT LEFT

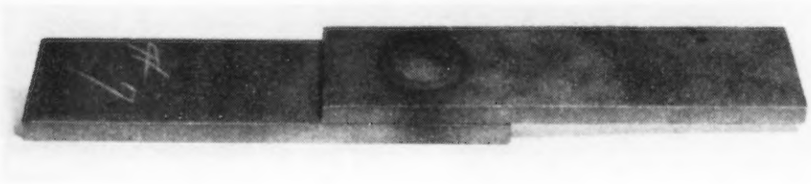
FIG. 5—Typical curve showing effect of current variation. For material 3/32 in. thick.

tip constant for each particular setting. With constant use, the electrode tip mushrooms, changing the tip area —hence the current density. With reduced current density, the heat of the weld is reduced, which will eventually result in no weld being made at all. To prevent this, machined electrode tips are used and are changed at definite intervals in order to maintain constant tip size and shape.

The size of the tip is adjusted in ratio to the thickness of the metal being welded. The heavier the thickness, the larger the diameter of electrode tip used.

Experience has shown that the best shaped tip to be used is a dome tip. The dome tip has a spherical surface, and the radius of this spherical section is adjusted to suit the kind of material and thickness being welded. The principal advantage of the dome tip is that it concentrates the welding current, does not require an accurate alinement as a flat surface tip, prevents excessive indentation, and will not mushroom very easily. These advantages are especially great when the heavier thicknesses of metal are welded.

When light materials are welded with low electrode pressures and low currents, flat tips are sometimes used on one side to produce a very minimum of surface indentation.



ABOVE

FIG. 7—Typical shear test specimen.

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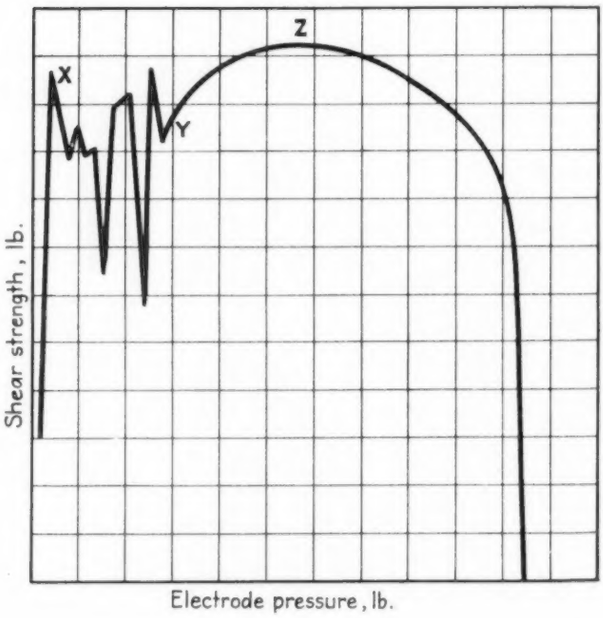
AT RIGHT

FIG. 8—Typical curve showing effect of pressure variation; all other settings constant. For low alloy steel 3/32 in. thick; 20 cycles.

Strength of Welds

Fig. 9 shows the results of an experiment that was made to determine the effects of timing and pressure on uniformity. The problem consisted of welding together a piece of 3/32-in. and ⅛-in. thicknesses of low alloy high tensile steel and finding the setting that would give a strength of at least 6000 lb. in shear and permit the largest variation in current or electrode pressure.

Three different timings were chosen: 15, 30 and 50 cycles. Electrode pressure was varied from 600 to 1600 lb. A shear sample was made at each electrode pressure for each of the three timings. The current was



varied from the minimum amount that would give a weld, to the highest setting possible without excessive indentation, shrink holes, cracks, etc. A series of samples of five to six different current settings for each electrode pressure and timing combination was made.

The values obtained in the shear test are plotted in the chart shown in Fig. 9. Circles have been drawn on the chart and located to show the electrode pressure and current used for each test. There are separate charts for each of the three timings. The figures within the circles denote, in thousands of pounds, the shearing strength obtained for each weld. Lines have been drawn on the right hand side of each of the three charts to indicate the current value above which the spotwelds would not be satisfactory because of deep indentation, cracks, etc.

AT RIGHT

FIG. 10—Effect of surface conditions.

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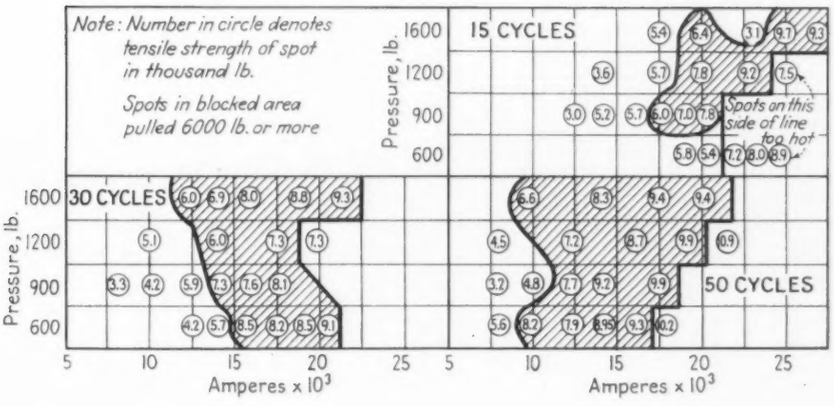
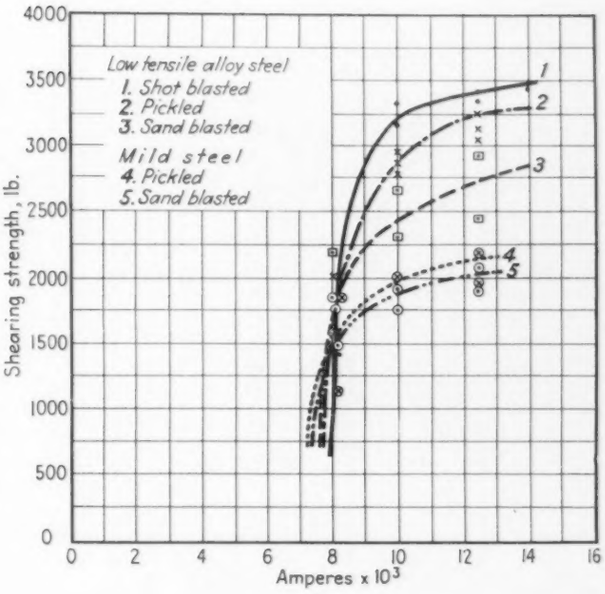
BELOW

FIG. 9—Effect of timing and pressure on uniformity. For low alloy high tensile steel, 1/8 to 3/32 in. thick. Electrode diameter, 3/8 in.





The spotwelds that pulled 6000 lb. or more that were located to the left of the "too hot" line are included in a shaded area. An examination of this shaded area shows that the most reliable results are obtained with the higher electrode pressures and the longer timing.

Surface conditions play a very important part in the results obtained by spotwelding. Fig. 10 shows the large variation in strength with three different types of surfaces when welded with the same machine settings. The heat produced in a spotweld is dependent upon the current used, the length of time it is applied, and the electrical resistance of the work between the welding tips. A large proportion of the electrical resistance is the contact resistance between the two or more pieces being welded together, and this resistance varies with the surface conditions of the work. This means that the welding heat (hence the strength of the weld) is also dependent upon surface conditions. The shorter the timing of the weld, the greater will be the effect of surface conditions on the strength of the weld.

Electrodeposit Thickness Tester

APPLICATION of the "Hull and Strausser" test of electrodeposit thickness to zinc, cadmium, tin and copper is described in a new technical service manual issued by the Du Pont company.

The method of rapid determination is classified as a dropping test. It is the work of R. O. Hull, of Du Pont, and P. W. C. Strausser, research associate, American Electroplaters' Society at the U. S. Bureau of Standards.

The Hull-Strausser test is termed particularly applicable to cadmium and zinc electrodeposited coatings, and is now included in several Federal specifications. It was adopted recently for electro-tinned coatings, and has been found a practical and rapid method of determining deposit thickness of the new Du Pont high speed copper.

Principle of the method is simple and can be employed with ordinary laboratory equipment, easily assembled or obtained complete. It is based on the fact that a coating is attacked by a chemical reagent at a constant rate if the reagent is applied to the surface in successive drops. Variations in the strength of solution are avoided by the use of fresh reagent of constant strength, constantly applied to the surface under test.

The bulletin gives directions for operation and the recommended solutions for best results.

THE author herein advances a filament theory for steel and cast iron and presents an empirical formula for determining maximum possible tensile strength. The author's ideas, of course, are very controversial, but still interesting—they may serve to shock some metallurgists into some active thinking on this particular subject.

The Strength of

By M. G. CORSON
Consulting Metallurgist, New York

THE various tests that combine to indicate the mechanical characteristics of steel are increasing in number, although a particular test may now and then fall in disuse. Not so long ago endurance tests were particularly popular, but their glory was short lived. Later came the damping and creep tests, which still seem to occupy a very prominent position.

No doubt each of these tests served or serves a useful purpose. Each has contributed to the growth of metallurgical science—although most of them appear destined to be merely additional tools of research, used now and then.

But, the oldest of all tests—that for the ultimate tensile strength—still is in first place. Not only is the tensile test rapid and inexpensive, but it is the only test that produces a precise physical value which cannot be misunderstood. And it is connected by some still obscure law to the true cohesion forces that operate in metals.

The tensile test is capable of yielding six figures directly measurable. Two of these, the proportionality limit and the "proof stress," are used but rarely. Two others, the yield point and area reduction, are not particularly precise. The last two, the ultimate strength and the corresponding elongation, are always used, and of these the ultimate strength is beyond doubt the most important. Besides, the value does not depend much upon the size of the test bar. The European bar 100 mm. long and 10 mm. in diameter yields values which differ from the ones obtained on the American bar by less than normal deviation.

In view of the accurate values obtained for ultimate strength, the question is often asked as to the value of ultimate strength that must be expected for a sample of steel for which the composition and recent history are well known. And, most naturally, in view of the great practical importance of steels that simply are hot rolled and air cooled, it is essential to know their tensile strength in precisely such a state. Also interesting is the question as to the maximum strength of a given steel after the brittleness due to the presence of martensite is just removed. However, this latter question is asked but rarely.

Factors Influencing Strength

The usual commercial hot rolled steel contains, in addition to a prescribed amount of carbon, various but always small amounts of phosphorus, silicon and manganese.

The variations in these three are not so easy to control, but essentially the limits are quite narrow and the analysis depends specifically upon the process used in melting, i.e., whether acid or basic.

Doubtless these small amounts of phosphorus, silicon and manganese either stay in solid solution or form inclusions. The latter influence most specifically the ductility of a given steel. The parts retained in solid solution, however, may have an influence upon the tensile strength. Unfortunately, there is still no precise data available concerning this influence. Of course, it might seem very easy to produce a number of steels in which only one element would vary, but the truth is that it would be very difficult. Laboratory tests made upon steels melted in an electric furnace may have but little in common with results in open-hearth practice. Besides, the study of the simultaneous influences of four elements (carbon, phosphorus, silicon and manganese) would call for at least 625 heats plus, in all probability, the same number of repeat and check-heats. Of course, the difficulties are not unsurmountable, and some day in the not too far distant future a thorough program of such research may materialize. However, so far, there is comparatively little detailed evidence for the action of the three minor elements.

Various assumptions made on this action during the past 20 years or so have not always coincided, and certain beliefs are definitely exaggerated. So, it is assumed quite frequently that a point of phosphorus raises the strength of steel uniformly by 1000 lb. per sq. in. Analogously, the effect of silicon is estimated variously — from 150 to 340 lb. per sq. in. strength increase per point.

That these figures are greatly exaggerated can be deduced from the magnitude of various effects when an additional element is dissolved in copper or some other metal. Silicon is a very potent strengthener for copper, and when added up to 2 per cent it raises the ultimate strength from 32,000 lb. almost uniformly up to 55,000 lb. per sq. in. This is at the average rate of 115 lb. per sq. in. per point. Other elements entering into solid solution have even less effect per point. So, making all due allowances, it should not be expected that any element staying in solid solution in the matrix of steel might raise its strength by over 250 lb. per sq. in. per point. And, this would mean that a carbon-free steel might possibly be about 4000 lb. per sq. in. stronger than pure iron. The matrix may have a value of 42,000 lb.

per sq. in., but probably does not reach such a figure.

Effects of Carbon

Carbon certainly has far stronger effect per point, because its state in steel is quite different. For, it is hardly likely that even 0.01 per cent carbon will remain dissolved in the ferritic matrix of a low carbon steel. The question is, what this specific state might be.

Certain typical structural features are associated with the state of carbon. It suffices to list martensite, troostite, sorbite, pearlite, spheroidized carbide and ferrite. The first essentially signifies a simultaneous occurrence of the highest hardness and brittleness. The others are associated with various levels of strength, with troostite belonging to the highest level. In addition, there has never been any lack of attempts to introduce new structural terms like osmondite, troosto-sorbite, etc.

Of the structures mentioned, only sorbite and spheroidized carbide are mechanically uniform. Thus, it might be stated that such a steel is so-and-so strong because it is sorbitic. Pearlite occupies separate fields except in nearly eutectoidal steels. A steel with 25 points of carbon has just about 30 per cent of pearlite in separate nests. A fracture might easily pass through a strictly ferritic field so that the presence of pearlite would have but little hardening effect.

It is the theory of this author that all these beautiful structural characteristics and their still more beautiful names are merely companions of the different levels of strength—not their causes. A steel is troostitic because at a given strength it tends to possess as well a large number of troostitic nodules—not vice versa.

According to this theory, every carbon alloy of iron is precipitation hardened even if it is subjected to a spheroidizing anneal for days. Only that precipitate of carbides which remains invisible accounts for the additional strength, and any specific state of steel is characterized by the amount of carbides still remaining in the ultramicroscopic state.

In other words, what is perceived on looking upon something which may be called troostite are merely the products of destruction of the true structure of steel. A localized accumulation of fine breakage is troostite. A rough breakage arranged in well organized heaps is pearlite, etc. But, the true structural frame of the building that remains intact is still quite invisible.

Particles or Filaments?

The first theory of precipitation hardening explained the action as being due to the presence of a large number of key particles interfering with slip. That, of course, is a suggestion that could not be preemptorily excluded. However, it must be stated that there is nothing in nature that could be used as an analogy on a magnified scale.

Quite different is the situation if it is assumed that the precipitated hardener—in the case propounded herein, carbide—forms filaments. Nature and human art present a number of analogies of this kind.

Reinforced Concrete Example

One such case can be seen in reinforced concrete structures. Here, a mixture of cement with fine sand and water forms the matrix of concrete. The heavy gravel used for ballast can be compared to pearlite, spheroidized carbide and various inclusions. But, the strength is due essentially to the wires and strips of iron which are imbedded in the matrix.

Suppose, a steel is visualized with filaments of carbide 10 times thinner than can be discerned under a microscope. Such a diameter would be about 0.0000004 in. Suppose it could be magnified one million times. Then each filament will look like a rod 0.4 in. thick—a frequent size in reinforced concrete structures. On the other hand, a particle of pearlite 0.0004 in. long and 0.0001 in. thick would look like a slab of stone 40 in. long and 10 in. thick. Certainly, the usual concrete might be regarded as a model of refinement in comparison.

In the ponds of the Eastern States there may be observed certain strange oval masses of a transparent jelly-like substance weighing up to 30 lb. and surrounding a stem of pickerel grass. Such masses result from the labor of a few generations of a tiny organism Pectinatella or moss animalcule. Not very strong, they are still strong enough to be cut into cubes which do not change their shape under the force of gravity.

These masses are built of 99.65 per cent water, 0.10 per cent of mineral substance that was dissolved in that water and only 0.25 per cent of an organic material. The high transparency of the whole structure—about 10 in. thick—indicates that the jelly-like mass is built of a network of fine fibers with all the water being carried in the interstices. No particles would form a solid mass when added in the amount of 0.25 per cent to water and no structure of films, no matter how thin would leave the mass as transparent as it is.

Such are the examples from art and nature. Another argument for the filament structure can be based on the principle of strain release.

Any solid solution stands under

strain, this being at a minimum at the moment of formation from the molten state but continuously increasing on cooling. And, if the strain becomes too great the solid solution breaks down and precipitates the material added. The larger the visible particle precipitated the more complete the release from strain. That is why an air cooled steel will have its carbide in the pearlitic state and an over-annealed sorbitic steel will form spheroidized carbide.

But it is not so with the ultramicroscopic particle. Only certain sizes running by stages can be accommodated with a minimum strain. Others would produce strains stronger than were present in solid solution. So, only a few minimum sizes form under a given set of conditions.

And, once a given minimum strain size is reached in one or two directions at one point, it is easier for the particle to grow in one direction almost across the whole grain than for other particles of the proper size to form in the proper places. So a filament structure or plate structure are most likely to form. Plates would affect ductility, but filaments would increase the strength.

Mechanism of Anneal

To explain the softening of hardened alloys (and steels) on annealing, the theory of particle precipitation must assume that some particles get dissolved and others built up, until they are no longer efficient as keys between slip-planes. For many reasons a process of this kind would be hard to realize.

On the other hand a filament needs only to break up in smaller sections, each section coalescing, in order to develop a minimum surface. It is particularly clear that filaments are quite likely to produce a pearlitic structure if the coalescence stops short of producing a near-spherical particle.

It is the author's opinion that the precipitation is most likely to result in an array (not necessarily a network) of filaments of the hardener. In certain cases the amount of such filaments can be controlled by proper heat treatment. In many others, the material develops an auto control of a rather precise nature. That is why the strengths of hot rolled and air cooled steels containing a given amount of carbon vary by less than 3 per cent. And, an analogous situation exists when cold rolled steels are annealed in a regular manner or when certain alloy steels air-harden with surprisingly uniform results.

The Strength Formulae

To compute the results to be expected, various investigators have offered their empirical formulae. Quite naturally the first tendency is always to find a simple proportionality factor. Then it was found that a proportionality law refuses to work and somewhat more complicated formulae were offered in which the carbon content enters in the square power. Such are the parabolic formulae.

Later on it has been found important to account in the formula for the well known effects of manganese, which in the light of the present theory amounts simply to an increased preservation of the carbide filaments. These formulae are composed of a number of terms, one of which carries the product of the manganese and carbon contents.

Nevertheless, all these formulae are strictly empirical. Of course all formulae must be empirical, i.e., based upon the study of practical data. However, empirical formulae may and may not have a logical foundation, and the formulae now in use do not. Then again, formulae may be applicable to a wide range or to a narrow one—the present-day formulae are narrow. They fail completely before the carbon content reaches 0.6 per cent.

There is, however, a mathematical expression which is logical and has a wide range of application. To present the basic idea, consider the following case.

A manufacturer possesses a number of well equipped units each requiring the labor of an organized team. This team working without disturbances has a certain maximum efficiency.

But, take two teams and put them in one room and the efficiency of each will fall. Put in three and the efficiency will fall still more. However, a higher total production will be obtained from two though less efficient teams, or three still less efficient teams, etc. For a time the total production will continue increasing in spite of the lowered efficiency. Then it will start decreasing.

This situation can be presented by the formula:

$$\text{Production} = NCe^{-bN}$$

Here N is the total number of teams, C corresponds to the scale of accounting for the production, and e^{-b} the efficiency of one team.

In the same manner, a molecule of iron carbide can be considered as the team of four workers (Fe_3C). The efficiency of each team will drop when other teams are added, but the total production of strength will continue increasing — up to a maximum point.

The factors C and b vary from one situation to another. Sorbitic steels drawn at 400 deg. C. after being oil quenched will require factors different from those valid for a water quenched troostitic steel or for cold rolled and annealed stock. It suffices, however, to determine the factors for two well chosen samples of different carbon content but of the same content (approximately) of manganese, silicon and phosphorus and of the same history, to obtain a formula which will be correct within 3-5 per cent for any amount of carbon present.

The author has applied this principle to a large number of published data on cold rolled and annealed steels. Assuming the strength of the matrix to be 38,000 lb. per sq. in., the additional strength has been computed as being represented by the formula:

$$S = C\ (162)\ e^{-0.8C}\ (1000)^x$$

C is in per cent. Using this formula, the following set of strength/carbon content data are obtained: 0.1 per cent, 56,800; 0.2 per cent, 65,650; 0.3 per cent, 76,300; 0.4 per cent, 85,100; 0.5 per cent, 92,200; 0.6 per cent, 98,800; 0.7 per cent, 103,600; 0.8 per cent, 107,200; 0.9 per cent, 109,100; 1.0 per cent, 111,000; 1.25 per cent, 112,700; 2.0 per cent, 104,000.

It can be seen from these figures that a normally annealed plain carbon steel will reach a maximum of 113,000 lb. per sq. in. strength at 1.25 per cent carbon, but the gain will be quite immaterial after the steel passes the eutectoid point. In fact no worthwhile increase in strength will take place beyond 0.8 per cent carbon.

On the other hand, beyond 1.25 per cent carbon there will be a slow drop in strength, and at 2 per cent carbon no more than 104,000 lb. per sq. in. could be expected.

Strength of Gray Iron

Like in steel, the usual constituents —carbides, pearlite, ferrite and different inclusions—will be found in gray iron. Now and then there will be patches of sorbite. Beyond all this visible picture there will be the invisible structure of reinforcing filaments of carbides, and in the foreground will be seen the flakes of graphite.

The matrix of cast iron could be considered essentially as cast steel.

The flakes of graphite, gas porosity and inclusions would represent the weakening factors.

Contrary to many an opinion, cast iron is not likely to be porous unless very poor materials and bad technique are used. The specific gravity of an average cast iron will not differ from the figure computed on the basis of analytical data by as much as 3 per cent.

So, in view of the presence of the large weakening effects of graphite, the weakening due to porosity might be eliminated as being of a minor importance. And, for a cast steel devoid of porosity there is justification to expect an almost full strength of the same steel in the rolled and annealed condition.

Again, there is no need to be troubled by the presence of phosphides, sulphides and mineral inclusions. They may be bad for ductility or hot working characteristics, but they will hardly affect the strength by more than their volume percentage—assuming them to be voids. And their total volume does not go beyond 1.5 per cent.

Consequently the problem reduces itself to the very simple question: What is the weakening effect of the graphite present? The graphite is present essentially in the shape of flakes. These flakes may vary as to their surface and thickness, and they may form various combinations and designs. These combinations are most likely to strike the eye, and there may be an inclination to start classifying the shapes that occur. The so-called rosettes might be given specific attention.

However, a rosette is not likely to be more than 0.03 in. across, or about 0.0009 sq. in. in area. The test bar will have an area of over 0.5000 sq. in. Put fully one hundred rosettes in every cross-section and no other flakes of graphite beside them, and the section will be reduced by 18 per cent. The strength—in the case of 0.6 per cent combined carbon—will be around 82,000 lb. per sq. in. Will not it be too good?

So, it is not the shape of the incidental ensemble that will affect the strength of the cast iron. It will be stronger or weaker according to the amount and size of the individual flake.

A Probability Problem

Suppose the graphite flakes to be quite uniformly distributed and always standing perpendicularly to the cross-section of the test bar. The loosest cast iron contains about 10 per cent graphite by volume. Therefore, these flakes will cut the section's active area by not over 10 per cent or so. It would be a mighty strong cast iron indeed.

Now suppose the same flakes to run only in the direction parallel to the cross-section. Then it will be quite impossible to escape the chance that here or there a section will run exclusively through graphite. The casting will have no strength whatsoever.

But how will the flakes of graphite be distributed in a real casting? This question cannot yet be answered because too little work has been done in the statistical studies of gray iron structures. It can be said, however, that on purely theoretical reasons the probability of a bad distribution increases greatly when the average flake becomes too wide and too thin. A short and thick flake (average estimated from microscopical study) means a strong iron, very "fine" (thin) flakes indicate a weak one.

The author is not ready yet to offer a logical formula in which the efficiency of weakening might be represented as analogously as the efficiency of hardening in steel. But, on the basis of a number of data studied there has been produced the following empirical formula:

$$\text{Per cent weakening} = 68 - 1.05\,R + 0.009\,R^2 - 0.000029\,R^3 + \frac{1330 - 400\,GR}{41.5 + GR}$$

Here R is the ratio of the length to the thickness of the average flake of graphite, while "GR" represents the analytical figure (percentage) or graphitic carbon. To use the formula the strength of the matrix must be computed first from the content of the combined carbon. Then, the strength of the matrix should be multiplied by the value of the above formula to obtain the maximum possible strength of the cast iron. If R = 1, the formula then becomes valid for malleable iron.

Steel's Future Prospects

AS part of his presidential address before the British Iron and Steel Institute, Mr. John Craig pointed out that while, "some of the pioneers in the steel industry showed great courage and possessed also sufficient optimism to carry them through many difficulties, they were not altogether free from pessimistic criticism. I remember Sir Hugh Bell telling me that his distinguished father, Sir Lowthian, had expressed the opinion that it was folly to seek to increase the output of pig iron in Britain when it had already reached 4,000,000 tons per year. Sir Lowthian held the view that there never could be a market for an increased output. I can well recall how, when one of my predecessors was anxious to build some additional open hearth furnaces in the early 'nineties, a good friend of the company appealed to his senior to stop what he described as the folly of the young man in desiring to make more steel, because the country could never consume it. It is always a difficult problem to know how to handle the periodic waves of pessimism which seem to creep over the world from time to time. Yet I think it can be safely assumed that the best time to build new furnaces is when the prophets declare that the country has too great a productive capacity. It would seem that those who have acted on this policy in the past have nothing to regret.

"It would be difficult indeed to say when a country has sufficient steel for all its requirements. The general advance in civilization seems to move with an increased output of steel. Whether it is steel that makes civilization or civilization that makes the demand for steel is a problem that I leave with you, but the fact remains that the two have grown together, and it does appear as if each step forward in civilization demands more steel, and that with the production of increased quantities and improved qualities of steel, an increase takes place in the standard of living, and so civilization marches on. The luxuries of life are associated with steel, and while it may be that there are critics today who regret the development of the can-opener and look upon it as a sign of decadence in domestic life, there can be no denying the fact that the tin can is providing the public with luxuries which, without it, would be quite imposible.

"I feel confident that what has been done during the past 50 years is no more than a foundation upon which the present and future generation can build a noble structure."

Let's Nurture the Machine

—And Reduce Technological Unemployment!

By CHARLES J. STILWELL
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"WHERE in the world do all these machines go?" That is the question that was asked me the other day by one of the men in our plant as we stood together and watched some large machines, just boxed, being shifted into a truck. Not having time for a lengthy reply, I answered that I thought those machines were going to every part of the world to be used in raising peoples' standards of living.

Not long ago there was brought to my attention a booklet on the subject of machines, published by a presumably reputable and non-partisan organization, and having a circulation to the general public. The purpose of this organization was purely educational, and I do not for a moment doubt the sincerity of the author of the booklet, but to me it was somewhat disconcerting to find that the conclusion drawn was that although machines had contributed very materially to improving the standard of living, in the long run they probably did more harm than good because of the number of men they threw out of work.

This idea that machines destroy jobs is not a new one, nor is it confined to authors of educational pamphlets. The idea is becoming surprisingly widespread. In newspapers, magazines, over the radio, and in political gatherings it is common to find references to technological unemployment based upon the assumption that new and improved machinery throws many thousands of men out of work.

How did this idea of technological unemployment originate? Is it all just a fallacy? Is it merely one of many queer ideas that have popped up in recent years? Does it arise in people's minds because of the temporary maladjustment of some jobs upon the installation of new machinery?

The fact is, there is nothing new about the idea that machines throw people out of work. There is nothing new about it for the reason that ever since mankind first learned the use of power there must have been repeated occasions when machines threw some people out of work for a short time.

Among some primitive peoples, it was the custom for women to draw the plow. Only within the last few years, in Mexico, I have seen a woman and an ox pulling a plow. I presume that when that farmer hitches a horse to his plow that woman will lose her job. In the early industrial period in England, and even in the United States when locomotives and other machines were first coming into use, there were actual riots over this question of technological unemployment. Workmen became frantic because they thought the new machines were going to drive them out of their jobs forever.

If we are to be honestly realistic about this question, it can be admitted that there is some temporary technological unemployment today, but I believe after careful examination we may conclude it is quite limited. For a moment, suppose we take three illustrations of the installation of new and modern equipment familiar to all of us. Take first the continuous rolling mill for strip steel.

In the same little booklet to which I referred a moment ago, there appeared a statement, if I remember correctly, in about these words: "Continuous steel rolling mills have thrown many thousands of steel workers out of employment—they walk the streets, and there is no work for them." *And yet today the steel industry has reached one of the highest employment peaks in its entire history.*

If we are fair and examine the true facts in the case, it will probably be found that on the day the new continuous mill starts to operate, the men who formerly rolled strip steel on the old hand mills do stop working on those mills. For a time there may result some unemployment of men in that particular mill. What really happens, however, is that very shortly competition demands that the next steel mill up the valley also install a continuous strip mill, and then a third mill, and so on, until competition in sheet-strip, produced by continuous mills, lowers the price, increases the use of strip steel, and in the combined total increased operation of the group of mills it will be found that the total pay roll has been increased, rather than that men have been thrown out of jobs.

The men remaining permanently out of work at the conclusion of such a process of new mill installation will probably be found to be very few, and even such men, in the increased total operation of the steel industry, will be adjusted to new jobs elsewhere.

Machine Buying Necessary

Second, consider machine tools. The buyer of machine tools does not act upon the premise: "Let me see, if I would buy five new machine tools I could fire 20 men." Machine tool buying does not proceed that way. The manufacturer buys new machine tools when he has to have them for some reason.

Bear in mind that machine tools are always bought for one of two reasons: First, to produce more goods, second, to produce better goods. The manufacturer's idea in buying machine tools is that he may employ men—not fire them. Remember this basic point of business economics: A manufacturer makes a profit only when men are working, not when men are laid off. The objective is productivity. He wants to enable his men to get out more production; he cannot accomplish that by firing men.

Now, third, let us take the case of an entirely new process, a tremendous step in technological and scientific development. I refer to the new continuous process of making rayon. By this new process the amount of production per individual employee has been tremendously increased. What happened to employment? The new development was housed in a brand new plant at Painesville, Ohio, and additional employees, rather than fewer, were employed to operate the plant.

Here let me call your attention to another thing that takes place in the installation of new machine processes. The new rayon plant cost $11,500,000. Since more than 75 per cent of the cost of production of all such facilities as the new rayon plant can be traced back to dollars paid in wages and salaries, the very installation of the new plant distributed hundreds of new jobs and a tremendous pay roll for people in Painesville and elsewhere over a period of several years, amounting to upwards of $7,000,000.

You must bear in mind always, that is exactly the process that is going on continuously in all the capital goods industries. The unemployment from which we may have been suffering for several years, and from which we have not yet emerged, is caused in large measure by the fact that there is insufficient investment going into new enterprises such as I have just described. If we can restore in this country a state of confidence in the minds of investors, if we can reach the point where new processes can be made to take the place of old ones every 10 or 15 years instead of every 20 or 30, unemployment, so far as the heavy industries are concerned, will disappear.

Any serious consideration of this subject indicates that the permanent displacement of men by machines accounts for an extremely minor part of the unemployment in the country today, and that most of the men actually so displaced before long find employment elsewhere, particularly in the service industries.

People who inveigh against the machines merely because they say it causes unemployment seem to me entirely one-sided in their viewpoint. They might just as well start an anti-water campaign, because water causes floods and drownings. People cannot live without water; the locations of early civilizations were determined by an adequate water supply, and civilization progresses by the use of water, not by doing away with it. Floods are terrible things, of course, but we are trying hard to control them and lessen their effect. To reduce the toll of drownings, we are teaching more peo-

THEY say continuous mills have thrown thousands of steel workers out of employment. Yet, today employment in the steel industry is at a new high.

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ple to swim. We are trying to teach people to use water intelligently, not to find a substitute for it.

Likewise, it seems to me, we must treat the increasing use of machines intelligently, and if in the growing employment of machine labor there develops some slight displacement of men and loss of jobs, proceed intelligently to cure that difficulty, and not condemn wholesale the machinery which has meant so much to us in our ever-increasing standards of living.

Machine Is Labor-Saving

Think of the machine first as a labor-saving device—labor-saving, not labor-destroying. By labor-saving device I mean just that: a device, a machine, which saves human labor, an invention by which steel and electricity can be made to do the work which formerly had to be done by human muscle. My father used to tell me of the days when, as a boy, he dreaded cradling down a 20-acre field of wheat and flailing out the wheat on the barn floor, by hand. Today, by the use of modern reapers and threshing machines we have eliminated a large part of the complete physical exhaustion which not so many years ago was the normal daily experience for many American people.

So I prefer to think of the machine as a labor saver, as a producer. It is a device which enables man to multiply the amount of his day's work by making it possible for him to turn out many hundreds of times as much work as, not so many years ago, he could by hand. That man now works fewer hours and for his labor receives much higher pay. If the average industrial workman in this country today tried to turn out by hand, or even by a less efficient machine, the work he produces on an up-to-date modern machine, he could work 24 hr. a day without stopping, and his daily output would still be far below what it is with the help of a modern machine.

Men can acquire wealth only as they produce wealth. They produce wealth only as they add to the value of the raw material they are working with. Therefore, because men create more wealth by the use of machines, and still greater wealth by the use of modern machines, they have gradually, over a period of years, received more wealth in terms of higher pay and the modern devices and comforts which that pay will buy; and on top of it all they have more hours of leisure in which to get enjoyment and comfort out of living. That is what I mean when I say I think of the machine as a labor saver. I think of it as a means of liberating hours of labor for profitable employment otherwise.

Now, for a moment, let us think of the machine as a creator of employment. This is quite the reverse of the viewpoint of people who like to say the machine destroys jobs. Machines create jobs because they cut costs and increase production.

The underlying force which constantly energizes industry in the direction of greater production is competition. In order to compete, a manufacturer installs machines which will cut costs and thereby enable him to offer a better product at a lower price. Because of the lower price, more people can buy. This increases volume. With increased volume, greater mechanization becomes possible, and this brings about a still further price reduction. With every price reduction, more people can buy. Again volume is increased, and so the cycle goes—and every increase in volume means an increase in employment, an increase which would be absolutely impossible if it were not for the contribution of machines.

Furthermore, every increase in volume creates a further increase in employment in newly developed fields. Think for the moment, as a result of the volume production of automobiles, of the number of people engaged in servicing automobiles, in the tire business, operating gas stations, building automobile highways—it even carries your thought to the thousands of men employed in the vast oil industry.

Automobiles are only one example. You can think in exactly the same way of electrical refrigerators, washing machines, vacumm cleaners, and the like. You know better than I how much additional employment in your industry has developed from the demand for motors in every one of these fields I have mentioned. Therefore, I maintain the net effect of the increasing use of the machine is, first, improved quality, next, lower price, then increased volume, and consequently increased employment. Let us take a few clear-cut examples.

Do you remember what a good electrical refrigerator cost in 1927? I do, for I bought one that year, and I paid $420 for it. Today, I am told, I could buy an improved model, more efficient, of the same size, for $169. This decrease in price was brought about chiefly by progressive mechanization made possible by increased volume of business.

Now, if we may believe the theory proposed by our friends, there is room for strong suspicion that with all this mechanization many men's jobs have been sacrificed. Let us see what really happened. According to the United States Census of Manufacturers, the electrical refrigeration industry employed, in round numbers, 11,000 men in 1927 and 50,500 men in 1937.

Do you remember what you had to pay for what was then considered a good radio in 1927? You can get much better reception on a $40 radio today than you could get on one that cost $150 not so many years ago. Radio is a perfect example of a purely mechanical development. It is a machine made on and by machines. In 1927 there were so few people employed in radio that they were not even listed in government figures. In 1937 the industry employed over 48,000 people.

Now, just out of your own recollection, compare an automobile which in 1927 cost, let us say, about $1,200 with an automobile which today costs about $900. In every way you can possibly think of, today's $900 car is so superior to the $1,200 car of 1927 that there simply isn't any comparison. The automobile industry is one of the most highly mechanized of all the industries in the country. By the use of constantly improved machines it has brought about this increase in quality and decrease in price. Meanwhile, employment rose from 370,000 in 1927 to 517,000 in 1937.

One very interesting illustration of the way in which machines create jobs is afforded by the glass container industry. Before glass bottle machines were invented, there were 28,000 glass blowers. Today there are 24,000 people directly employed in making glass containers, and some 600 making glass container machinery. But that is only the beginning of the story. There are 66,000 milkmen, 73,000 people working in and around milk stations, 13,000 people packing and preserving foods in glass containers, and 30,000 people employed in industries in which beverages are bottled in glass. This type of industrial activity would have been impossible without the invention and installation of the glass bottle machine, which made possible low-priced glass containers.

I might continue indefinitely with illustrations such as these. The significant fact is that the greatest increases in employment in American industry have taken place in the very industries which have been most highly and progressively mechanized.

In 1870, 32.4 per cent of our population were gainfully employed. By 1900 this had risen to 38.3 per cent, and by 1930, a depression year, to 39.8 per cent. These are the latest U. S. Census figures available. In spite of all the current talk about unemployment, I will venture a guess that the 1940 census will show a still further increase.

It is further significant that the number of jobs per unit of population has increased more rapidly in mechanical and manufacturing industries than is the case in other occupations. In short, after a period of the most intensive progressive mechanization the country has ever seen, there are a higher proportion of people employed than has ever been the case before in this country.

Now, let us go back to the question of such current technological unemployment as does actually exist in the country in these days. Small as it is, it is unfortunate. Certainly everything that can be done to correct it should be done. But I do not believe it is a matter of attacking the machine.

Rather, it seems to me, efforts to eliminate technological unemployment should be along the line of employment plans and policies. After all, a man is not fired by a machine—he is fired by an employer. And always remember the employer makes money only when he keeps his men working. I think that throughout all industry employers are becoming more cognizant every day of their employment responsibilities, and doing everything they can to minimize employment fluctuations and to maintain employment continuity.

From every possible point of view—from the point of view of humanitarianism, and from the point of view of business profits—employment stability is a goal which is universally desired.

Now, if we want to tackle the broad subject of unemployment, let's tackle a phase of unemployment which really amounts to something—not just a little corner which is represented by technological unemployment.

What, if anything, can be done to help smooth out the extreme peaks and valleys of the business cycle? What can be done to alter the violent seasonal nature of some businesses? What can be done to key employment levels to a company's annual volume of business, instead of permitting them to fluctuate in line with current orders. These are some of the big problems in the employment picture, and they are being considered more seriously today than ever before.

In conclusion: I stated at the beginning of this discussion that there were really comparatively few cases of technological unemployment today, and that most of these were temporary in their results. I want now to qualify that statement. There are, here and there, certain definite instances of technological unemployment which are extremely severe.

Every now and then, in almost any field of industry, you will see a company which is falling behind in mechanization—a company which fails to buy enough new machines and enough new equipment, and struggles along with old and antiquated facilities. That company cannot keep its costs down to the level enjoyed by its competitors who are following a policy of progressive mechanization. Very shortly that company finds it cannot meet the prices or the quality offered by its competitor. It, therefore, loses business. As its production volume goes down, it begins to lay off men. Finally, if it does not change its policy, it winds up in the bankruptcy court, and all the people who formerly worked with that company are out of a job.

That is what I would term in fact technological unemployment.

Portable Magnetic Crack Detector

IN recent years a new method of crack detection has been devised which uses as its indicator the concentration of fine particles of iron upon any discontinuity in or near the surface of a magnetized specimen under examination. For very fine cracks it has been found most effective to use a specially reduced iron dust carried in almost colloidal suspension in dry oil.

As an alternative to methods of dipping a large specimen or flooding it with the prepared fluid, a convenient portable crack detector was recently placed on the market by the Metropolitan-Vickers Electrical Co., Ltd. (England).

The new detector is in the form of a thin hollow disk-shaped container filled with dust-laden oil and provided with one or both sides transparent so that the concentrations can be observed. It is, of course, applicable only to flat surfaces. For other shapes, the specimen must be immersed in a bath of the fluid.

The method of using the new portable detector is simple. The specimen to be examined is first magnetized and the detector is then placed upon its surface, preferably in a horizontal position and gently tapped or rocked. Any crack in the surface is soon, within about 15 to 20 sec., clearly indicated by a black line formed of the fine iron particles which are attached to the magnetic poles created at the edges of the crack. As with the larger scale applications, the indication is very sensitive and unmistakable, showing even haircracks which could scarcely be detected by ordinary microscopic examination. Each test takes only a few seconds. After the indication has been noted, shaking the detector redistributes the iron dust ready for the next application. Routine tests or elaborate explorations can thus be rapidly made.

This new portable crack detector is stated to be proving useful both for industrial routine inspection of ferrous materials and also for instructional work in schools and colleges. Apart from the detection of flaws it can be used for the study or demonstration of leakage paths in magnetic systems, the magnetic fields associated with current-carrying conductors, the effects of work-hardening of steels, and many other magnetic and metallurgical problems. It can even be used to indicate the presence of electrostatic fields.

For most purposes the residual flux in a magnetized specimen is sufficient to give clear indications in the detector, but a large increase in sensitivity can be obtained by increasing the field strength, as, for instance, by the use of magnetizing coils while the test is applied, with high degree of magnetization it is possible to locate subsurface faults.

GERMANY'S ALUMINUM ECONOMY

By ROBERT J. ANDERSON
Consulting Engineer, Cleveland

WITHIN the last few years Germany has become the largest producer and consumer of primary aluminum in the world, and at present its works capacity for aluminum output appreciably exceeds that of any other country. The United States has been displaced from leadership in these respects. German output of primary aluminum was more than the American in three years of the period 1934-1938 and but little less in the other two years. Total primary output by Germany for this five-year period was 498,700 metric tons as against 452,600 tons by the United States. Recovery of secondary aluminum by the latter is still by far the largest.

The remarkable growth of the German aluminum industry is displayed by the statistics of output and consumption for late years. In this connection it is of interest to compare the short-term development of Germany and of the world. Output of primary aluminum by Germany in 1929 was 33,000 metric tons and total world output was 282,200 tons. The corresponding figures of aluminum consumption for the same year were 32,600 and 269,600 tons. Thus, in 1929 Germany accounted for 11.8 per cent of world output and 12.1 per cent of world consumption. In 1938 the output of primary aluminum by Germany was 165,600 tons and total world output was 579,900 tons. For that year the respective figures of consumption were 176,600 and 515,100 tons. So in 1938 Germany produced 28.6 per cent of world aluminum output and consumed 34.3 per cent of the total quantity taken into use.

Based on the same figures German output in 1938 was nearly 400 per cent more than in 1929 as compared with an increase of 105 per cent for the world. Also, the aluminum consumption by Germany in the former year was over 440 per cent greater than in 1929 as against a rise of only 91 per cent for the world. The United States makes a poor showing in relation to Germany and the world.

The rapid expansion of the aluminum industry in Germany during late years has been due to a combination of forces engendered by the country's bad situation as to domestic supplies of metals in general, the autarchic drive for self-sufficiency, and preparations for war. Germany is seriously deficient in ores of most metals, including both copper and aluminum. In

TABLE I
German Output and Trade: Bauxite and Raw Aluminum
(Thousands of Metric Tons)

	Bauxite		Aluminum			
Year	Output	Imports[a]	Output[b]	Imports[c]	Exports[c]	Consumption[d]
1913	0.4	38.5	1.0	15.3	2.7	13.6
1920	13.4	13.7	12.0	7.8	2.9	16.8
1929	2.0	387.0	33.3	14.2	4.1	32.6
1930	..	300.4	30.7	9.7	5.6	23.4
1931	..	211.0	27.1	4.7	4.7	21.2
1932	0.4	200.7	19.3	1.8	2.5	18.1
1933	1.7	239.1	18.9	2.8	3.2	26.0
1934	6.6	326.5	37.2	9.0	0.7	48.8
1935	8.3	505.4	70.8	16.4	0.2	83.6
1936	12.6	981.2	97.5	5.8	0.2	102.3
1937	19.9	1313.2	127.6	6.2	1.3	128.6
1938	19.4	1184.6	165.6[e]	18.7	2.8	176.6[e]

(a) Including cryolite. (b) Primary metal. (c) Primary metal, scrap, and alloys. (d) Excluding imported scrap for all years except 1913 and 1920. (e) Including Austria.

order to improve its economy and trade balance the Nazi Government has promoted the importation of ores rather than raw metals and forced the use of domestic in place of foreign materials. The necessity of utilizing aluminum produced at home has been specially stressed under the slogan "Deutsches Metall."

For some time prior to the new European war the use of aluminum for many purposes had been obligatory in Germany under governmental regulations while that of copper, lead, tin, and other metals was prohibited. As a direct result of state control the consumption of aluminum has been intensively stimulated over the last few years. In fact, aluminum now stands first in the non-ferrous metal economy of the country. This rank is on the basis of volume but not of weight.

WITH serious deficiencies in copper, lead, tin and zinc, Germany has forced the use of aluminum. The results of this action may be highlighted as follows:

(1) Germany is the world's largest producer and consumer of aluminum.

(2) The Government owns 70 per cent of aluminum works capacity.

(3) An experimental plant produces alumina from domestic clay.

(4) Steam-generated power is used for aluminum production.

(5) Germany's lead will be maintained over the few years to come.

Conditions of Production

Like some other countries that are major producers of aluminum, Germany is wholly, or almost wholly, dependent upon foreign sources for supplies of ore (bauxite). But in contrast to all others it is the only country in which the substantial preponderance of primary aluminum output is made by means of steam-generated electricity. Hydroelectric power is well-nigh exclusively employed for aluminum production elsewhere. Furthermore, Germany is unique among capitalistic nations in that its primary industry has been developed mostly with the aid of state funds. At present about 70 per cent of the aluminum works-capacity in the country is owned by the Government.

The deposits of bauxite found in Germany are small and the material is low grade. It is unsuitable for use in preparing alumina by alkaline extraction processes. Domestic output of bauxite has been lesss than 20,000 tons annually since 1918. This home material is employed mainly in the manufacture of abrasives and chemicals. Ore for the German aluminum industry has been imported from a number of countries including France, Hungary, Italy, Jugoslavia, the Dutch East Indies, and Greece. For various reasons Hungary and Jugoslavia have lately become the most important sources. German imports of bauxite have exceeded 200,000 metric tons in every year since 1924. The average quantity imported in 1936-1938 was about 1,100,000 tons or nearly one-third of world output for the period.

Large deposits of high-grade bauxite in foreign countries are owned or controlled by German capital (state and private). The dominant interests are centered in the Bauxit Trust A.G. with head office at Zürich, Switzerland. This is a holding company which manages the operations of subsidiary mining concerns abroad. Its bauxite properties are in Hungary, Italy, Jugoslavia, Greece, and Rumania. Stock of the Bauxit Trust A.G. is owned mostly by the Vereinigte Aluminium-Werke A.G. The latter is the largest aluminum producer in Germany and is entirely in possession of the state.

In passing, it may be remarked that investigations have been carried out in Germany for many years with the object of devising industrial processes for the extraction of alumina from domestic raw materials other than bauxite, especially clays. None of the methods contrived has proved economical. However, the attendant technical difficulties are now claimed to be solved. In 1938 a plant to produce alumina from clay by the Goldschmidt sulphite process was put into operation by the Vereinigte Aluminium-Werke A.G. The annual capacity is about 8000 tons of alumina.

Germany, excluding Austria, is not favored with good sites for the development of cheap hydroelectric power. But the country contains great resources of solid fuels (both bituminous coal and lignite). Lignite — the so-called brown coal—is the most inexpensive fuel available in Germany. Owing to this general situation electricity for the aluminum works has been supplied chiefly from lignite-fired steam plants. Two important producers of power for the primary aluminum industry are the Elektrowerke A.G. and the Innwerk A.G. Both are controlled by the Vereinigte Industrie-Unternehmungen A.G., the holding company for industrial and other enterprises of the German Government.

While the economic water power of Old Germany has been almost fully utilized, that of the Austrian territory still remains largely undeveloped. A number of hydroelectric stations has been projected for construction in the latter region to supply current for new aluminum works that are to be established there.

Germany may be regarded as practically self-sufficient with respect to the auxiliary materials used in producing alumina and aluminum. These materials include fuels, certain heavy chemicals, fluorspar (employed as the source of fluorine in preparing synthetic cryolite), and carbon of grades suitable for the manufacture of electrodes.

Primary Aluminum Situation

Nearly all of the works capacity for producing primary aluminum in Germany was installed in two periods, namely, (1) during the World War,

TABLE II

German Output and Consumption of Metals

Metal	(Thousands of Metric Tons) Output	Consumption	(Thousands of Cubic Meters) Output	Consumption
1929				
Aluminum	33.3	32.6	12.3	12.1
Copper	53.6	216.4	6.0	24.3
Copper[a]	119.4	254.0	13.4	28.5
Lead	110.3	217.4	9.7	19.1
Tin	4.0	16.4	0.5	2.2
Zinc	102.0	200.2	14.8	29.0
1938				
Aluminum	165.6	176.6	61.3	65.4
Copper	68.8	366.0	7.7	41.1
Copper[a]	313.4	446.9	35.2	50.2
Lead	185.2	260.9	16.1	22.9
Tin	7.9	20.2	1.1	2.8
Zinc	194.4	269.4	28.2	39.0

(a) Refinery.

and (2) subsequent to 1934. The large-scale primary industry of the country was actually created in the former period, and capacity was increased about fourfold in the five-year term 1934-1938.

In 1913 there was only one aluminum-reduction works in Germany. Its annual capacity was about 1000 metric tons. In the same year imports of raw aluminum were approximately 15,000 tons. At the close of the war there were six works in operation and the total capacity was about 35,000 tons. Two of these works were dismantled shortly afterward. In 1938 there were eight reduction works operating in Greater Germany and the total capacity was approximately 170,000 tons. Two small works came within German boundaries when Austria was annexed.

Continuing the program of increasing capacity, works are still being enlarged and further additions have been projected. The total of new capacity which may be ready by 1941 has been estimated at 80,000 tons a year. Then the annual capacity of Germany would be about 250,000 tons. By way of comparison the total capacity of aluminum works in the United States for the same year has been forecast at 200,000 tons.

At present, primary aluminum is produced in Greater Germany by the following five companies: Vereinigte Aluminium-Werke A.G., Aluminium G.m.b.H., Salzburger Aluminium G.m.b.H., Aluminiumwerk G.m.b.H., and Oesterreichische Kraftwerke A.G. The first is owned by the German Government and its stock is held by the Vereinigte Industrie-Unternehmungen A.G. Both the second and third are subsidiaries of the Aluminium-Industrie A.G, of Switzerland. Stock of the fourth concern is owned by I. G. Farbenindustrie A.G. and Metallgesellschaft A.G., each holding one-half interest. The fifth company is engaged mainly in the generation and distribution of electric power in Austria.

The Vereinigte Aluminium-Werke A.G. operates the following properties: The Lautawerk, at Lautawerk (Lausitz), which includes an aluminum-reduction works and an alumina plant; the Erftwerk, at Grevenbroich (Lower Rhine), comprising a reduction works and an electrode factory; the Innwerk, at Töging (Bavaria), a reduction works; the Nabwerk, at Schwandorf (Bavaria), an alumina plant; and the Lippewerk, at Lünen (Westphalia), including a reduction works and an alumina plant. As already mentioned, the Vereinigte Aluminium-Werke A.G. is the largest producer of primary aluminum in Germany. Its total operative capacity has been estimated (as of 1939) at upward of 110,000 metric tons a year. About 36 per cent of this is installed at the Lautawerk.

Besides its works in Switzerland and Italy the Aluminium-Industrie A.G. owns two aluminum works in Greater Germany. The main office of this company is at Neuhausen, Switzerland. One of the German works is at Rheinfelden (Baden) and the other is at Lend (Austria). Subsidiaries of the Swiss concern control these properties. The Rheinfelden works is operated by Aluminium G.m.b.H. and the Lend works by Salzburger Aluminium G.m.b.H. Annual capacity of the former is about 24,000 tons and of the latter about 4000 tons. Another German subsidiary of the Aluminium-Industrie A.G. is the Martinswerk G.m.b.H. This is a large producer of alumina with plant at Bergheim.

The Aluminiumwerk G.m.b.H., owned jointly by the I. G. Farbenindustrie A.G. and the Metallgesellschaft A.G., operates an important reduction works at Bitterfeld. Annual capacity is approximately 30,000 tons.

A small reduction works at Gmunden (Austria) is owned by the Oesterreichische Kraftwerke A.G. It is called the Steeg works. The capacity is about 2000 tons a year.

Gebrüder Giulini G.m.b.H. is an influential integrant of the primary industry in Germany, being a large supplier of alumina for aluminum reduction. It has a plant at Mundenheim, near Ludwigshafen.

The statistics assembled in Table I reflect the situation of the primary aluminum industry in Germany over a period of years. As may be noted, its development has been very rapid since 1934. Most of the figures are as reported by the Metallgesellschaft A.G.

Manufacturing Branches

The aluminum working-up industry of Germany has been intensively developed in all branches and constitutes an important part of its metal economy. Notable progress has been made in various directions during the last five years owing mainly to the forced use of aluminum, under governmental regulations, in place of copper, lead, tin, or zinc. In this connection, numerous companies that previously had worked only other metals were constrained to take up the manufacture of aluminum-base products. Germany had long before ranked among the foremost countries in the fields of semi-finished and finished aluminum goods. Also, it has been a leading exporter of some wares, particularly foil.

Corresponding manufactures of aluminum and its alloys are produced in Germany and other important industrial countries. The chief classes include sheet and related rolled products, extrusions, forgings, wire and cable, pressings, stampings, castings, and powder.

Many kinds of aluminum commodities are made by subsidiaries of, or firms associated with, the principal primary interests and also by a large number of independent concerns in Germany. At one time most of the primary output was worked up by the latter inasmuch as the aluminum producers were poorly represented in the manufacturing branches. This situation no longer obtains. During the last 15 years primary companies have been continually integrating in the working-up industry and now manufacture a wide range of both finished and semi-finished goods. The activities of the Vereinigte Aluminiumwerke A.G. may be especially pointed out. One of its subsidiaries is a large producer of aluminum foil while another is a leading manufacturer of structural shapes and the like.

Semi-manufacturers of aluminum, both cast and wrought, are likewise produced by numerous independent concerns, that is, those not controlled by the primary interests in Germany. Some of these independents are principally engaged in the electrical equipment, aircraft, motor vehicle, or special machinery industry, and many work other metals besides aluminum. About 25 large firms account for the bulk of output in aluminum semi-manufactures and include the foremost companies in the general metal field. Aluminum cable is made by several important concerns.

Finished aluminum goods are manufactured in Germany by several hundred firms. Most of them are small. The range of products is wide. It includes cooking utensils and other household wares, light stamped articles of numerous kinds, assembled equipment for use in the chemical and food industries, containers, collapsible tubes, building specialties, and paint.

The manufacture of cast parts in aluminum alloys is highly advanced in Germany. Castings are made by the usual processes—sand, die, and permanent mold. About 60 per cent of the output is produced by 20 large firms. Many small foundries are owned by independents and a number are operated in connection with plants of various industrial companies.

German output of secondary aluminum has increased markedly over the last decade. More than 90 per cent of the secondary ingot sold is produced

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THE aluminum fabrication industry in Germany has been intensively developed in all branches and now constitutes probably the most important part of its metal economy. Aluminum alloys are used for a great deal of construction work, for paint, extrusions, forgings, wire and cable, castings, and sheet and related rolled products.

o o o

by five companies with annual capacities of up to 5000 tons. An appreciable amount of scrap is worked up in small foundries. Large quantities of scrap have been imported for years and effectively utilized in place of new metal.

Governmental Control

The aluminum industry of Germany has long been subject to a high degree of control, both governmental and cartelized. This applies not only to the producing but also the manufacturing branch.

Two regulations were enacted in 1917 to protect the primary interests against foreign and domestic competition. In accordance with one the erection of new and the enlargement of existing aluminum works, as well as of alumina plants, were made contingent upon approval by the government. In accordance with the other, all consumers were prohibited from purchasing primary aluminum in foreign countries unless domestic producers could not or would not supply the metal on equivalent terms. The first regulation is still valid but the second was annulled in 1930 and replaced by an import duty.

Very stringent control of the German metal industry was established in late years under the Hitler regime. The broad object was to regulate the trade most advantageously for the whole economy as dictated by totalitarian principles. Since 1934 aluminum and other non-ferrous base metals have been controlled by a state board. This board has governed all commerce in such metals, manufactures thereof, scrap, compounds, and ores. It has likewise regulated the output, consumption, stocks, imports, exports, delivery, applications, and prices of these commodities. In general, this control has been similar to that ordinarily set up under war economy. Transition to the latter was readily effected in September, 1939.

Many orders affecting the disposition of metals in Germany have been issued by the state board. These have mostly concerned prohibitions against the use of imported metals for various purposes and indirectly have forced the application of aluminum. Also, the compulsory utilization of the latter has been directly enforced by special decrees. One regulation has required the substitution of aluminum for copper, lead, tin, nickel, and other deficient metals. Another has made mandatory the use of aluminum for a multiplicity of specific purposes. Control of applications has been feasible since consumers can not purchase metals without a license from the board.

Following are some forced uses of aluminum: Apparatus for chemical processing, building construction, cans and containers, collapsible tubes, electrical conductors and electrical equipment in general, parts for many kinds of machinery and small tools, transport vehicles (air, land, and water), and various classes of sheet metal work.

In 1934 the German state board in charge of metals cooperated with another governmental agency having jurisdiction over prices and worked out a complicated price-fixing system for non-ferrous metals. The resulting schedule was made compulsory. It applied to selling prices for raw metals (including primary, secondary, and scrap of various classifications) and for manufactures. In October, 1939, maximum prices were set under the war administration.

As is known, the cartel movement originated in Germany and has been generally favored by national policy. A number of cartels were organized in different branches of the aluminum working-up industry over a period of years. These cartels formerly controlled output, markets, and prices of the various products. Under National Socialism they have functioned mainly as advisors to appropriate boards of the government.

Comparative Metal Economy

As a highly industrialized nation Germany has long ranked among the largest consumers of non-ferrous base metals in general. But at the same time the country has badly lacked home resources of ores from which its requirements could be produced. The shortages have necessarily been covered by imports, either of ores or raw metals.

In this connection, some data that show the deficiency of Germany as to domestic supplies of the important non-ferrous metals are of interest. The figures cited are for the five-year period 1934-1938, and include Austria for the latter year. Total mine output of copper in Germany for this term was only 147,000 metric tons, smelter output 306,700 tons, and consumption 1,210,800 tons not including secondary

material. Thus, the domestic mine output of copper was just a little over 12 per cent of the consumption and smelter output was about 25 per cent. Total refinery output of copper was 1,350,700 tons and consumption of refined copper was 1,664,200 tons. These latter two figures include metal recovered from scrap and also consumed in manufacturing plants without refining.

For the same short-term period German mine output of lead was 351,200 metric tons (about 34 per cent of consumption), smelter output 747,200 tons (about 72 per cent), and consumption 1,033,700 tons. The smelter output of tin was 37,300 tons and the consumption was 88,500 tons. Mine output of zinc was 848,700 tons (about 79 per cent of consumption), smelter output 691,200 tons (about 64 per cent), and consumption 1,080,900 tons. Finally, home output of primary aluminum was 498,700 tons as against consumption of 539,900 tons. In this case a shortage also obtained.

The relative position of metals in Germany's economy for 1938, the last year of complete record, and 1929 are displayed by the data in Table II. As is seen, output and consumption are expressed on the basis of both weight and volume, that is, space occupied. To compare the weight-outputs of metals that differ much in density (as, for example, aluminum with density of 2.7 and copper 8.9) is, of course, quite misleading. The volume-outputs serve more correctly to represent the definitive quantities.

At any rate the comparative advance of aluminum in Germany has been striking. Aluminum output in 1938 was about 400 per cent larger than in 1929, while copper refinery output was 162 per cent more. That of lead was 68 per cent higher, tin 98 per cent, and zinc 90 per cent. The approximate increases for consumption were: Aluminum 442 per cent, refinery copper 76, lead 20, tin 23, and zinc 35 per cent.

German imports of non-ferrous metals and ores are carried mostly by ocean shipping. In the present war they are shut off by the Allied blockade as in 1914-1918. Shortages are therefore to be expected. Germany may be able to obtain ample supplies of high-grade bauxite by rail transport from neutral countries (Hungary and Jugoslavia) but this seems unlikely. If it can, aluminum output and consumption should be further increased during the current war. In any case much dependence is being placed on aluminum to offset the lack of other non-ferrous metals.

Soft Soldering of Monel, Nickel and Inconel

SOFT soldering is one of the oldest of the commonly used methods of joining. According to the International Nickel Co., its usefulness for joining the strong corrosion resisting materials, Monel, nickel and Inconel, is limited to those applications where soft solder is not corroded readily.

Soft solder is inherently of low strength, and usually dependence for strength must be placed on riveted, lock seamed or spot welded joints, with the soft solder acting only as a sealing medium. The process is limited usually to joints in sheet metal not more than .050 in. or 0.062 in. thick, because other processes yield stronger joints in these and heavier gages.

The composition and melting points of soft solders commonly used on Monel, nickel and Inconel are given in the accompanying table. Of these the 50-50 and the 60-40 tin-lead solders are used most widely. The trade uses the 60-40 rather than the eutectic 63-37 composition. Pure tin is justified only where corrosion conditions demand its application.

Only those soft soldering fluxes known to the trade as "acid" fluxes are recommended for use with Monel, nickel or Inconel. Rosin is not suitable since its cleaning action is too mild. The proprietary or "cut acid" fluxes commonly used for copper are adequate for the soft soldering of Monel and nickel, but a somewhat stronger flux is required with Inconel because of its chromium oxide film. In general, proprietary soft soldering fluxes are to be preferred largely because of convenience.

All traces of flux should be removed after the soldering operation has been completed.

Surfaces of metal parts to be soft soldered must be clean and free of any surface oxide or other discoloration. Foreign material, such as oil, must be removed. Oxide or other tarnish can be removed mechanically with emery cloth or by light grinding, or chemically by pickling. Wherever possible, the surfaces to be joined should be pre-tinned to insure complete bonding during the final soldering or "sweating in" operation. Pretinning is done with the solder to be used for the joint and not necessarily with pure tin as the term would seem to indicate. With untinned edges the solder may not penetrate throughout the joint.

The heat necessary for the soldering operation is supplied by a soldering "iron" (really a soldering copper), city gas-air torch or oxy-acetylene torch. Because the transfer of heat through the high nickel materials is slower than through copper, it is necessary to use either a hotter or a slightly larger soldering copper than that regularly used for similar jobs in copper.

Commonly Used Soft Solders*
Their Melting Points and Shear Strengths

	Temperature of Complete Liquefaction, Deg. F.	Temperature of Complete Solidification, Deg. F.	Shear Strength, Lb. Per Sq. In.
Pure tin	450	450	2865
63-37 tin-lead	359	359	6230
50-50 tin-lead	414	359	5740
40-60 tin-lead	460	359	4975

* International Tin Research and Development Council.

For inspection grinding of alloy steel billets, portable grinders mounting 6 or 8-in. diameter wheels are frequently employed.

Billet Grinding

Factors Affecting Cost

By A. O. ROUSSEAU
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BILLET grinding started some 30 years ago with the grinding of self-hardening high-speed steel billets, too hard to be cut by any other tool.

Later, certain grades of alloy steel that had to be perfectly free from surface defects were ground in billet form, and still later it was found necessary to grind practically all chromium-nickel and high-chromium steels, which are known for their stainless and heat resisting properties.

During these years much progress has been made in the development of abrasives and grinding wheels and in better grinding methods. The result is that billet grinding is now done not only much faster but with an accompanying improvement in quality. And the cost has been reduced to the point where grinding can compete with other cleaning methods formerly considered less costly.

The majority of billet grinding is done on swing-frame machines mounting 14, 16, 18, or 20-in. diameter grinding wheels in widths from 2 to 3 in. Some inspection grinding is done with portable grinders mounting 6 or 8-in. diameter wheels. Today for nearly all billet grinding, resinoid or rubber-bonded wheels running at a speed of about 9500 surface ft. per min. are used. Only steel that is very sensitive to heat stresses is now ground with vitrified-bonded grinding wheels running at a speed of about 5500 surface ft. per min.

Variation in Production Rate

The rate of production and grade of finish is much better with the faster running resinoid or rubber-bonded wheels. As judged by the rate of material removed per hour, the rate of production varies greatly among the steel mills. The kind and size of steel ground as well as differences in methods and practices are responsible for much of this variation. As a rule it is found that the higher the tensile strength of the steel the more difficult it is to grind the steel and lower production and higher wheel wear must be expected.

Cost of grinding is almost directly comparable to the percentage of material removed and follows closely the variations in amount of grinding necessary on different kinds of steel. Small billets with more area to be ground per unit of weight will cost more than large billets or blooms with less area to be ground per unit of weight. However, the smaller billets have usually been rolled down from a larger size and consequently the defects have been elongated and are more shallow. It then follows that the amount of material removed per sq. in. of surface will be less for smaller billets and so the cost of grinding is not directly proportional to the area ground.

Wheels Employed

The wheels used on swing-frame machines for billet grinding are generally made with coarse grit and of fairly hard grade. Most of the wheels are operated in such a manner that the corners do a good part of the work and the face is more or less rounded. As comparatively high pressures are more effective, the cutting grains must be anchored deeply and firmly enough to get the greatest economy.

Certain kinds of steel, particularly stainless and heat-resisting alloys, may require a better grade of finish to avoid the possibility that grinding scratches will show in the finished product. In that case it is advisable to use fine grain resinoid wheels or rubber bonded wheels. As the rubber wheels are affected by grinding heat

to a much greater degree than resinoid wheels, it is important to use more moderate pressures with rubber wheels. If proper pressures and very judicial operation can be maintained, the grinding cost with rubber-bonded wheels will not be much higher than with resinoid wheels.

Factors Affecting Economy

Casual observation of snagging (on floor stands and under swing frames) is not likely to suggest that such grinding would lend itself to scientific analysis. Irregular shape and condition of the work and noise and vibration present would seem to defy classification of causes and effects, under the laws of mechanics. Even laboratory tests, with conditions controlled as closely as possible, are subject to grave "experimental error."

However, by application of the law of averages to results from many tests of the same nature and by comparison of averages with known laws of mechanics, certain principles affecting economy are made evident. Often the limit of application of one or more kinds of economy measures already has been reached on a given operation. Sometimes a single trial will not demonstrate a potential saving because of unforeseen complications. On the whole, however, there is always a chance of lowering grinding costs when the management has an accurate understanding of fundamentals.

Speed and Pressure

With a given grinding wheel, two important mechanical factors under control which affect economy are (1) wheel speed and (2) grinding pressure. Increase in either of these factors generally increases the economy of grinding.

Application of these factors will be discussed from the standpoint that any increase in the rate of production is a gain in economy so long as there is no neutralizing rise in cost from some other direction. A higher rate of production means lower labor and overhead cost per unit of product.

(1) *Wheel Speed:* From a simple geometrical consideration, the amount of material removed from the work under constant pressure grinding is the same for each revolution of the wheel at a given diameter. Therefore, rate of cut is proportional to surface velocity of the wheel. In practice and within limits, rubber and resinoid wheels approach a fulfillment of this geometrical prediction. Vitrified wheels do also, but within more narrow limits: they are more likely to digress because of increased vibration at higher speed.

COST-AFFECTING fundamentals discussed herein include wheel speed, grinding pressure, and grade of wheel employed. The data are based on studies made in the laboratories of the Norton Co., as well as on experience in the field. It is pointed out that wheel manufacturers are continually working to develop stronger bonds, superior abrasives and better methods and that due to improved wheels, grinding costs have been lowered some 25 per cent in the past few years.

Safety is the most important limiting factor of high wheel speed. Maximum safe speed depends upon the type of bond, bonding strength in the wheel, and type and condition of the machine. Practical maximum speeds commonly quoted are 6000 surface ft. per min. for vitrified snagging wheels and 9500 ft. per min. for the rubber and resinoid types.

Geometrical prediction for rate of wheel wear is the same as for rate of cut. In other words, as the rate of cut is increased by increasing wheel speed, so does the rate of wheel wear increase in proportion. Therefore, theoretically, the rate of wheel wear also varies in proportion to the wheel speed. Consequently, the wheel cost per unit of material removed remains constant, but the higher wheel speed reduces labor and overhead per unit work removed.

(2) *Grinding Pressure:* The general effect of greater pressure is higher rates of cut and of wheel wear in such order as to lower total grinding cost. Such effect is more pronounced with rubber and resinoid wheels than with vitrified wheels. Improved economy is thought to be due to broader contact. The face of a snagging wheel in use is always more or less rounded. More pressure sinks it further into the work and thus broadens contact. The advantage due to higher pressure is positive. When higher rates are gained by use of a softer wheel at the old pressure, the net result may be either a gain or loss in economy.

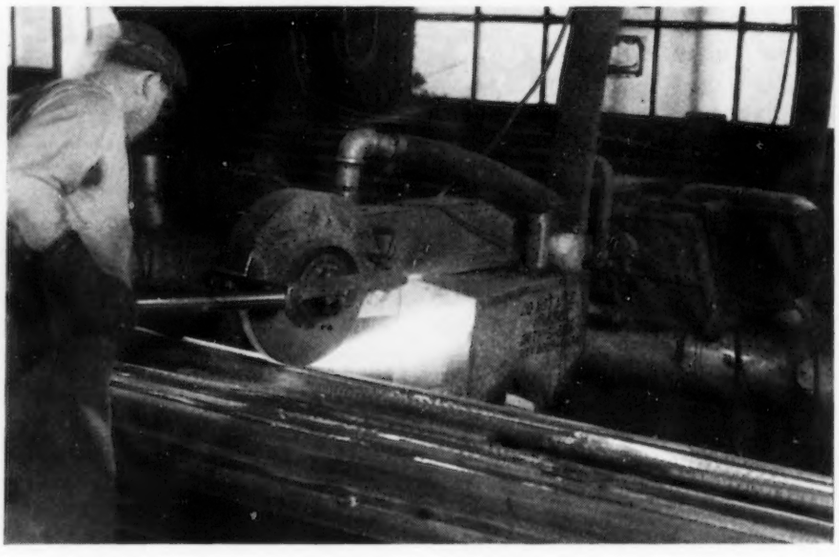
Practical limits in going to higher pressures are fatigue of the operator, danger of wheel breakage, and work requirements. Pressure must be kept low enough to allow the operator complete control of the operation.

Experimental results, with three different pressures on the same wheel are shown in Table II.

Grade of Wheel

In addition to the two mechanical factors, there is another factor which has an important bearing on wheel economy, i.e., the grade of wheel.

When rate of cut is changed, incidental to improved economy, the question of change of grade of wheel arises. In general, a higher rate of cut is likely to call for a slightly harder or more wear-resistant wheel.



The majority of billet grinding is still done on individual swing-frame machines.

TABLE I
Effect of Wheel Speed

Wheel used	12 grit hard resinoid		
Work and machine	Stainless steel, swing frame		
Grinding pressure	175 lb.		
Wheel speed, sur. ft. per min.	9600	8600	6500
Wheel diameter, in.	16.0	14.5	11.0
Wheel wear, cu. in. per hr.	10.5	12.2	10.8
Steel removed per hr.	10.2	9.4	6.5
Ratio material removed to wheel wear	0.97	0.77	0.6
Cost per lb. material removed:			
Wheel cost	4.4¢	5.5¢	7.1¢
Labor and overhead	9.8¢	10.6¢	15.4¢
Total	14.2¢	16.1¢	22.5¢

Total grinding cost per unit of product is influenced by the grade of wheel, relative to grinding conditions. The total cost is at a minimum when wheel grade is adjusted so that time charge (labor plus overhead) and wheel cost are about equal. Tables I and II show a reduction in time charge with little change in wheel cost, as rate of cut is increased. In case the time charge should fall much below the wheel cost, a more wear-resistant wheel would bring the two divisions of cost back near equality and would reduce further the total cost. It so happened that the wheels represented in both tables were too hard for minimum total cost under each respective initial condition.

There is another (practical) reason for a more durable wheel (harder grade) when a higher speed or higher pressure is used on rubber and resinoid wheels. Heat is generated at a faster rate and the bonds of these wheels are susceptible to wear by heat.

Treatment in the two preceding paragraphs is based on the well-established fact that a softer wheel, under the same pressure and speed, wears and cuts at faster rates. When a softer grade is used to increase rate of cut, increase in rate of wear is greater than the increase of cut—consequently the time charge per unit of work diminishes while wheel cost per unit of work rises.

Discussion of Economy Factors

Discussion in general is intended to be a statement of some of the principles which are the foundation of economy in snagging and billet grinding. They apply mainly to cases in which substantial amounts of metal are removed from areas of the work. There are a few jobs on which increased rate of cut is of little or no advantage in speeding production. For example, if a piece of work requires only skinning and if, for some reason, the wheel cannot be moved over the work any more rapidly than at present, a faster cut would save no time but would waste metal.

Magnitude of reduction in grinding cost which may be effected by changing each of the two numbered mechanical conditions depends upon how well the grade of wheel has been selected for the initial conditions. Higher wheel speed and higher pressure will result in more profit if the wheel has been too hard, as illustrated in the initial conditions in Tables I and II, where time charge is high relative to wheel cost. Both tables, however, show the direction of trend that may be expected regardless of initial conditions and of initial wheel.

Geometrical predictions of effects of variations in the two factors discussed can be summarized as follows:

(1) Wheel Speed (Constant Pressure):

Rate of cut and rate of wheel wear are proportional to surface speed of the wheel. Wheel wear per unit of work ground remains constant regardless of wheel speed. Economy is gained through the higher rate of production.

TABLE II
Effect of Grinding Pressure

Wheel used	12 grit hard resinoid at about 9000 sur. ft. per min.		
Work and machine	Stainless steel, swing frame		
Grinding pressure, lb.	100	140	200
Wheel wear, cu. in. per hr.	7.1	19.4	28.4
Steel removed, lb. per hr.	5.2	12.6	21.6
Ratio, material removed to wheel wear	0.73	0.65	0.76
Cost per lb. of mat. removed	5.8¢	6.5¢	5.6¢
Wheel time charge (labor plus overhead)	19.2¢	7.9¢	4.6¢
Total	25.0¢	14.4¢	10.2¢
Reduction from initial cost, per cent		42	59

Calculated grinding cost in the tables are based on these assumed constants: Time charge (labor plus overhead) per hr. $1.00; Resinoid wheel, cost per cu. in. used $0.0425.

TABLE III
Effect of Pressure on Contact Time

Pressure	Wheel Wear, Cu. In. Per Hr.	Material Removed Lb. Per Hr.	Per Cent Contact
Wheel No. 58, 1512/3—Q6B-4 Vitrified			
200 lb.	52.2	14.33	53
175 lb.	46.9	12.13	47
150 lb.	36.5	11.91	47
125 lb.	23.5	9.49	39
100 lb.	18.2	6.84	27
Wheel No. 121, 12/3—Q6T-H Resinoid			
200 lb.	28.2	12.58	54
175 lb.	25.8	11.91	37
150 lb.	18.8	9.71	47
125 lb.	14.1	7.72	27
100 lb.	4.69	4.41	31

(2) Grinding Pressure (Constant Speed):

Higher pressure increases both rate of cut and rate of wheel wear. Practical gain appears to be greater with organic than with vitrified wheels and appears in the form of faster production.

Wheel to Work Contact

An interesting study was recently made in the Norton research laboratories on a vitrified and a resinoid-bonded wheel to find the relation between pressure and actual contact time. The following conclusions were made:

As pressure was decreased from maximum, the general trend of the efficiency for the two wheels tested was downward. This tendency was definite with the resinoid wheel, but rather indefinite with the vitrified.

There was also a decrease in the amount of contact for both wheels, even though the measured runout was less under the lighter pressures. At first sight this would seem contradictory, but it shows that higher pressures cause the wheel to remain more in contact with the work, vibrating up and down with the out-of-round shape of the metal, not just hopping from one high spot to the next. The latter is the case under very light pressures. The action is identical to that of a cam and its follower. Some sort of pressure must be used to assure complete contact. (See Table III.)

The fact that there is about 25 per cent decrease in the per cent contact of both the resinoid and vitrified wheels when pressure is decreased from 200 to 100 lb. indicates that comparison of contact of two different wheels must be made at the same grinding pressure, else there may be a basic differential of contact due to pressure difference.

Junior Motors Demand Precise

By C. C. HERMANN

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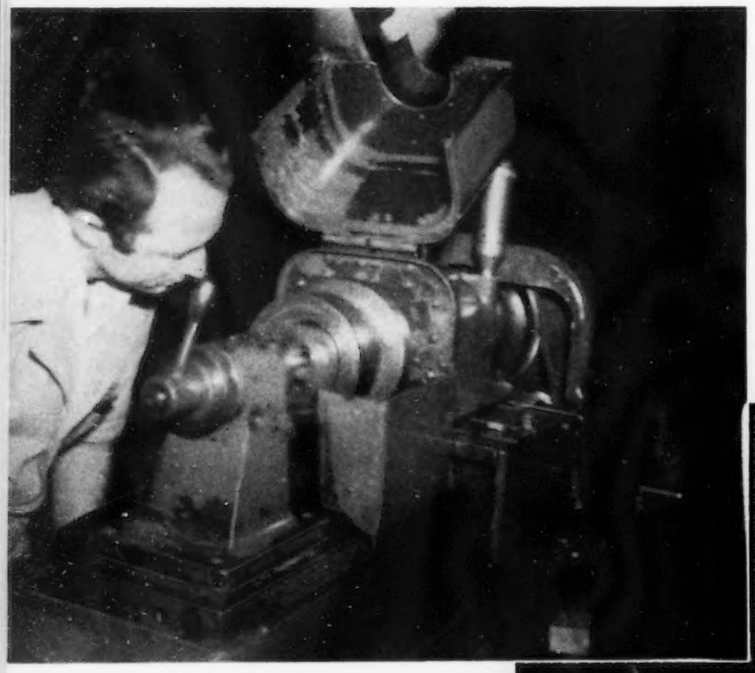
MODEL building, whether for pleasure or for the more serious purposes of commerce, has long constituted an important phase of life in the United States. Because of this insatiable desire of the American boy, and not infrequently his Dad, to master the intricacies of mechanisms, there has resulted an invigorating stimulus for manufacture.

One of the latest additions to the long list of miniature models is the gasoline engine for use in airplanes, boats, miniature racing cars, bicycles and many other uses. Close to a hundred thousand miniature motors were manufactured and sold during the past year and output for 1940 promises to far exceed this figure. The manufacture of miniature gasoline motors has become an industry of considerable proportions and the outlook is exceptionally bright.

One of the first to realize the commercial possibilities of the miniature gasoline motor was William L. Brown, president of Junior Motors Corp., Philadelphia. Edward Roberts, vice-president of this concern, which has been manufacturing motors for the past seven or eight years, says they expect their 1940 production to exceed last year by two or three hundred per cent.

The question might be asked as to the limitations of the miniature gasoline motor with respect to weight and displacement. In the beginning of the industry the goal was far from being clear—the one requirement was to construct a miniature two-cycle engine which would be light enough to be mounted in a heavier-than-air machine, have sufficient power output to offer encouragement in the matter of turning over a "prop" at sufficiently high speed to lift the ship, and possess stamina enough to stand up under the abuse of exceptionally high speeds. These and other important requirements were met easily enough but at a considerable expenditure of money.

Having demonstrated an ability to construct such a motor the next important step was to develop sufficient



ABOVE

FIG. 1—The cylinder is bored as shown here, the tool entering from the skirt end.

o o o

AT RIGHT

FIG. 2—This gage is used to test the cylinder for bore trueness.

Manufacture

demand to warrant mass production since it was by such means alone that the price of the motor could be brought within the reach of the average American boy. The contest spirit of American youth had to be brought into play and this was accomplished through the National Aeronautical Association which now has model airplane clubs affiliated with it throughout the country.

The N. A. A. rules specify three classes of flying models, namely, Class A having a cubic displacement of gas motor from 0 to 0.20 cu. in.; Class B of from 0.21 to 0.30 cu. in.; Class C of from 0.31 to 1.25 cu. in. The demand appears to be heaviest for Class B—therefore, it might be of interest to follow the "Brownie" motor through the shops of Junior Motors Corp.

The Brownie motor is shown at the head of this article, complete with gas tank and ignition coil retainer but less the coil and battery. The motor consists of a single cylinder of two-cycle design having a bore of 0.77 in., stroke of piston of 0.625 in., a displacement of 0.29 cu. in., and weighs a total of 5 oz. The motor has an idling speed, when equipped with prop, of 500 to 600 r.p.m. and a top speed with flywheel or prop of 10,000 r.p.m. The motor has 72 individual parts in its assembly.

The fuel used is regular white gasoline of low grade, mixed in the ratio of 4 parts gasoline to 1 part SAE 70 oil. The gas tank holds ¼ oz. of fuel. The tank is a glass cup screwed to the bottom of the mixer valve, the needle adjusting valve being at the top. The fuel is drawn into the crankcase of the motor through a tube and around the needle valve, the latter being capable of adjusting the mixture from rich to lean over a wide range, as from 1 to 6 rich down to 1 to 15 lean.

The intake manifold, consisting of a tube having an elongated base, is electric welded to the steel cylinder. On the opposite side of the cylinder is located the fuel passage connecting the crankcase space with the combustion chamber. The cylinder is bored on a Heald Boremaster machine Number 48 A, as shown in Fig. 1, by screwing the base of the cylinder into a jig which fits the jig holder on the machine. The boring tool revolves and

AT LEFT

FIG. 3—This operation tests the pistons for round and size.

o o o

BELOW

FIG. 4—All the separate parts are brought to one point and assembled in this manner.

enters the cylinder from the skirt end. The cylinder is a single piece, the top having the cooling vanes for air cooling and having the spark plug hole drilled and tapped through the end metal.

The tolerance of the cylinder bore is plus or minus 0.002 in. The bore follows airplane engine practice of hyperbolic boring. Since the piston in this engine is fitted with two rings, the piston is not honed in the cylinder. However, on those models in which rings are not used the piston is honed in the cylinder and the matched assemblies are maintained in the unit. The testing of the cylinder for bore trueness is observed in Fig. 2.

The piston is an aluminum casting, turned and ground. Two ring grooves are cut and the connecting rod pin holes are drilled. In Fig. 3 is shown the operation of testing of the pistons for round and size.

The connecting rods are forged aluminum, both ends milled and bored. The crankshaft is forged chromium-molybdenum steel. The machining operations on this element are performed on a straddle mill to machine to length as well as surface the crank cheek. The crankpin is hardened to 280 Brinell and then ground to size.

The crankcase is made of aluminum by permanent molding methods. The top of the case is bored and threaded to receive the lower end of the cylinder. The crank bearing barrel is bored to receive the bronze bushing comprising the crank bearing. This bushing is a press fit in the aluminum casting. The timer arm fits over the end of the crankcase and the make and break spark cam fits over the end of the projecting crankshaft between the end of the crankcase and the prop bub.

Assembling of the motor is shown in Fig. 4. The piston and connecting rod are first assembled by inserting the bronze piston pin. The piston is then equipped with its rings and assembled in the cylinder at the same time slipping the lower end of the connecting rod over the crank pin. A plug is then screwed into the open end of the crankcase closing the case. The mixer valve then is assembled on the engine, the spark plug screwed into the top of the cylinder and the timer, timer cam and prop nuts assembled in place.

In the early days of the industry the company made its own spark plugs, approximately ½ in. long, for this Brownie model. Having perfected a plug for the purpose, the makers of Champion plugs contracted to produce plugs and placed their own design on the market. Since that time plugs have been purchased. The compression ratio of the motor is 5.7 to 1. The voltage of the two dry cells in series is three volts, which is stepped up to 5000 volts by the coil. The current consumption by the spark plug is 200 milliamperes. The spark plug gap is adjusted to from 0.01 in. to 0.015 in. The range of the timer is from 12.5 deg. retard to 12.5 deg. advance. The contact points are tungsten and adjusted to 0.011 in.

As a final test and inspection, each and every motor is completely tested and run-in with a prop secured to the crankshaft. With speeds of upward of 10,000 r.p.m., balance of the rotating parts is an important consideration even with these small motors. The flywheel, which is 2 in. in diameter and 1 in. thick, is made of solid steel and is accurately balanced. The assembled crankshaft, piston and connecting rod is balanced within close limits, the weight of the piston and rod being offset by the weight of the crank cheek. The propeller, likewise, is balanced prior to mounting. The assembly is checked for balance in the testing department prior to shipment.

Speculum or White Bronze Plating

IN the March 21 issue, page 44, it was announced that a new process had been perfected for the co-deposition of tin and copper in the proportions in which these metals occur in "speculum"—the highly reflective and tarnish-resisting alloy that was used in ancient times for mirrors and, in later years, for telescopes and other optical instruments.

The new coating provides a pleasing silver-like alternative to chromium and perhaps may find application for motor car, refrigerator and household fittings; shop fittings and decorative metal work; tea and coffee sets; spoons, ash trays and numerous other forms of hardware.

The speculum plating process has been in industrial operation in a factory in Birmingham, England since the middle of 1939, and has proved to be a satisfactory commercial proposition. The solutions required are inexpensive and easily obtainable, and operation of the bath after suitable instruction is said to be simple and rapid. The standard proportions of tin and copper in the coating are, respectively, 40 per cent and 60 per cent, but between 35 and 55 per cent of tin can be deposited. The process has been worked out for basic metal such as copper, brass, bronze, nickel-silver and tin- or lead-base alloys (e.g. pewter or Britannia metal). For steel an undercoating is required, and nickel or red bronze (10 to 12 per cent tin) is recommended. If deposited on a smooth surface, the speculum coating comes down almost bright and attains its full luster with no more polishing than is required to remove water stains from other finishes.

The coating is said not to be easily scratched in normal use, being intermediate in hardness between nickel and chromium. A high degree of protection is obtained with a comparatively thin deposit.

The economic advantages of speculum plating may be appreciated from the following:

The cost of the metals deposited is low.

Initial cleaning and polishing processes are not complicated.

Only one plating bath is used.

There are no noxious fumes requiring special ventilation ducts.

No special precautionary measures are required to protect the workmen.

There is no intermediate cleaning or polishing.

Cost of final polishing is no more than the cost of removing water stains.

The process may be worked only under license, for which application should be made to the International Tin Research and Development Council, in care of Battelle Memorial Institute, Columbus, Ohio, who will supply initial working instructions and give free technical assistance in overcoming difficulties.

What's New in Power Transmission Equipment

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By FRANK J. OLIVER
Associate Editor, The Iron Age

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FROM speed reducers to bearings, this review covers some of the new types of power transmission machinery placed on the market within the last few months, including new controls for variable speed units, motor drive conversion units for machine tools, a unique mercury flotation clutch, flexible couplings, pillow blocks and new anti-friction bearing designs.

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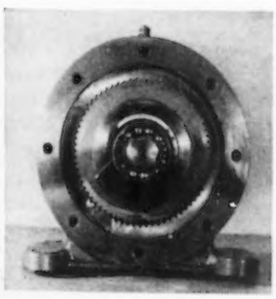
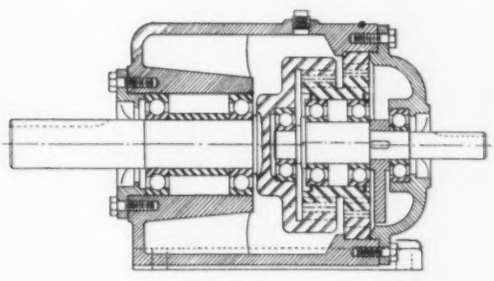
A COMPACT speed reducer with ratios from 20:1 to 7500:1 and corresponding efficiencies of 90 to 70 per cent has been introduced by the *Brad Foote Gear Works*, 1301 S. Cicero Avenue, Cicero, Ill. In the design a double spur or combination spur and internal gear, ball bearing mounted on a drive shaft eccentric, meshes with a fixed internal gear. The eccentric drives the initial spur gear around the pitch line of this internal gear and also drives a second spur gear, integral with the first, about the pitch line of another internal gear integral with the output shaft. To obtain large ratios, a small difference between spur gear and corresponding internal gear teeth is used since the ratio for each set is the number of teeth in the internal gear to the difference in the number of teeth between spur and internal gear. Since under these conditions the circular pitch line of the spur almost conforms to that of the internal gear, a large number of teeth are engaged, increasing the load carrying factor and compensating for the fact that high loads may be developed at the teeth with such high ratios of reduction.





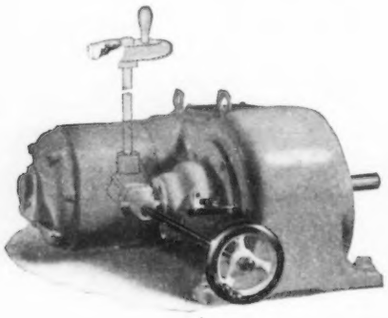
Vernier Control on Variable Speed Transmission

FOR installations where extremely fine control of speed changes is desired, such as in synchronizing the speed of two machines, justifying for shrinkage and expansion of such products as textiles and paper, obtaining exact register, controlling feeders, etc., the *Link-Belt Co.*, 2045 W. Hunting Park Avenue, Philadelphia, is now offering a vernier control for all sizes of its P.I.V. variable speed transmission. This vernier control can be supplied with either one or two ratios, 7½:1 or 30:1, and is equipped with two handwheels. One is for direct control, the other for secondary control either 7½ or 30 turns to one of the direct handwheel through a worm

and wheel arrangement, thus giving micrometer adjustments of speed.

Varidrive Motor Control

RIGHT angle, mechanical remote control for its Varidrive motors is being offered by *U. S. Electrical Motors, Inc.*, of Los Angeles and 80 34th Street, Brooklyn, N. Y. The control is intended for application when



this variable speed motor drive is mounted beneath or above the driven machine or is otherwise inaccessible. The speed control shaft may be extended at a 90 deg. angle in any one of eight directions, drive of the control shaft being effected by an inclosed set of helical gears. This right angle remote control permits the handwheel to be placed within easy reach of the operator.

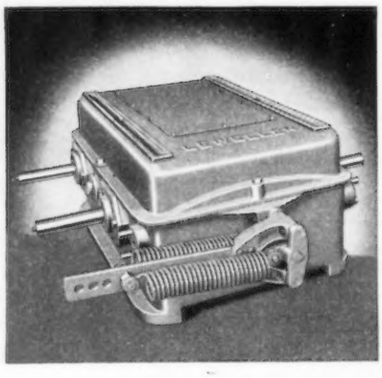
Variable Speed Drive

THE infinitely variable motorized speed transmission made by the *Lenney Machine & Mfg. Co.*, 733 Niles Road, Warren, Ohio, has been extensively redesigned. Using a disk and friction roller, the design has been so changed as to practically eliminate all thrust in cross shafts and bearings. In effect it is an automatic pressure

regulating clutch of simple form. Precision ball bearings are used throughout. Oil is sealed within the case and lubrication is effected by the splash method. The output end cover has been redesigned to conform to modern streamline design. Speed indicator dial conveniently located on top of the unit allows the operator to select the speeds accurately. The drive has a speed range of 225 to 925 r.p.m. when driven by a 1750 r.p.m. motor.

Safety Control on Drive

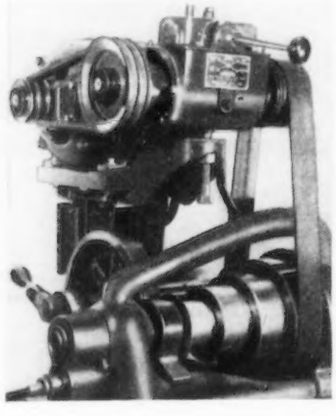
IN a special Lewellen variable speed transmission designed to regulate stoker speeds for feeding fuel at rates to maintain the boiler pressure automatically, a spring connection is interposed between the lever hooked up with the boiler control and the shifting mechanism in the transmission. Thus, while the lever follows any rapid motion of the pressure controlling device, stoker speeds are adjusted only at a safe controlling rate of ac-



celeration. The control lever may be moved over 90 deg. ahead of the transmission control. When the boiler pressure returns to the preset figure, the safety lever has reset for the operating position and the speed to which the transmission has been changed is maintained until another change takes place in the boiler pressure. This unit is made by the *Lewellen Mfg. Co.*, 1040 East 10th Street, Columbus, Ind.

Belt Drive Transmission

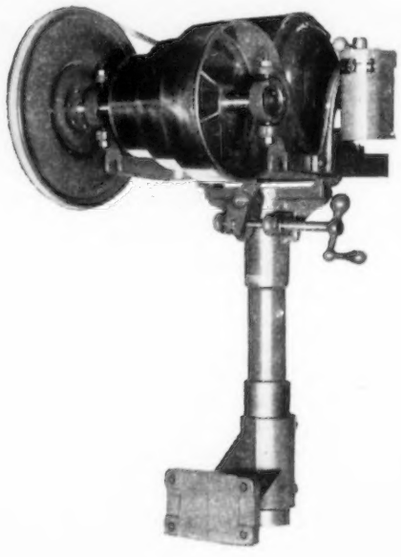
FOUR-SPEED transmissions for application to cone-head belt driven machine tools are announced by the *Western Mfg. Co.*, Detroit. There are



three sizes made, with ranges of 1 to 5 hp., 5 to 10 hp. and 10 hp. and above. Four speed changes from 1:1 up to 4:1 are made progressively by a single lever as in an automotive transmission. Transmission case and covers are of semi-steel and gears and spline shafts are of alloy steel, machined to close limits and ground. Revolving shafts are mounted on anti-friction bearings and oil seals are used at outlet points. The unit comes with motor bracket and attachment post for application to various types of machine tools. The 1-5 hp. size is shown applied to a toolroom lathe.

Ball Bearing Motor Drive

BALL bearing equipped "Modern" motor drives are announced by *Quality Hardware & Machine Co.*, 5841 N. Ravenswood Avenue, Chicago, which last year brought out a plain bearing conversion unit for application to cone head drive machines. This new series includes 15 models for lathes, shapers, milling machines and turret lathes. V-belts are used for



the motor drive to the countershaft, which runs in two ball bearings, the final drive to the machine being by flat belt. A crank and screw control which actuates a cam bearing against the base of the motor and countershaft mounting, provides for adjustment in belt tension and for shifting of the flat belt on the cone head. Drive control is hand operated, though the units can be equipped for electrical controllers. In addition to the column mount illustrated, the company is also producing a series of ball bearing drives for mounting on punch presses, power hack saws, drill presses and similar equipment.

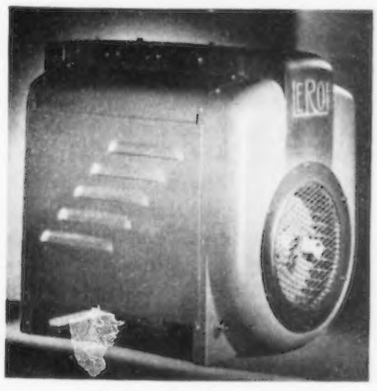
Nonslip Pulley Covering

INVENTED some 40 years ago, but heretofore not manufactured on a commercial scale, a special nonslip pulley covering is being offered the trade by the *Nonslip Pulley Covering Co.*, 777 Hertel Avenue, Buffalo. The material comes in sheets containing 9 sq. ft. Pieces are torn from it of width and length to go around the pulley twice including the lapping. Before application, the material is soaked in hot water to soften the substance. The material is unconditionally guaranteed; a single application usually lasts a couple of years. Practically all belt slippage is said to be eliminated, thus increasing the productivity of machines.

Gasoline Power Unit

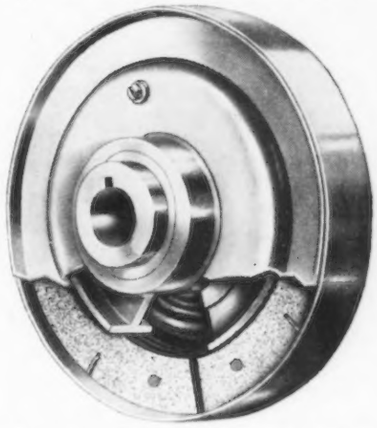
A NEW, heavy-duty type, 10 to 16 hp. four cylinder, valve-in-head air-cooled engine, which will operate on either gasoline or natural gas, has been introduced by the *Le Roi Co.*, Milwaukee.

This engine is available as an open unit, or fully enclosed in a steel housing designed by *Stolper Steel Products Co.*, Milwaukee. This new unit has been designed especially for the more severe types of service. The crankshaft runs in three precision type bearings, valves seat on chrome-molybdenum inserts and the cylinders and crankcase are an integral casting. The cylinder bore is 2¾ in. and the stroke 3 in. With this engine, Le Roi offers a complete line of power take-offs, including clutches and speed reducers.



Mercury Clutch

BY unique application of the flotation principle, a new type of mercury clutch developed by the *Mercury Clutch Corp.*, Massillon, Ohio, permits a driving motor to attain speed before assuming load, thus enabling smaller motors to be used for a drive than when starting is done under full load. Only four principal parts comprise the clutch: the driving member or outside housing; the driven member or inner drum; a series of molded clutch segments, and the mercury. When the motor starts up, the



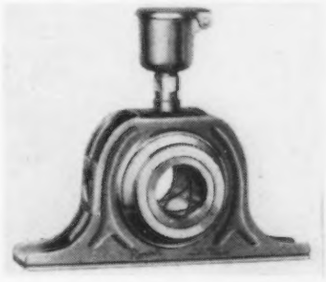
mercury is distributed about the inner circumference of the housing and the fluid buoys the linings inward where they engage the driven drum smoothly on their inner edges. A series of driving lugs in the housing prevent the linings from shifting circumferentially and thereby transmit the torque. At present, 4 and 4½ in. diameter sizes are standard. They will transmit loads up to 5 hp. Besides being used as a clutch, this unit may be utilized as an automatic brake to become effective at a given speed, or it may be used as a flexible coupling.

Worm Speed Reducer

AN intermediate line of worm reduction units, designated type 2⅝ A, has been added to the line of the *Abart Gear & Machine Co.*, 4832 West 16th Street, Chicago. The units have a base to worm center height of 5⅝ in. and overall height of 7 in. The reducers are capable of handling inputs from ¼ to 2 hp. at 1800 r.p.m. and from ⅛ to 1½ hp. at 1200 r.p.m. Ratios range from 4 5/6 to 100 to 1. Worms are alloy steel, hardened and ground; wheels, nickel bronze. Shaft mountings are ball bearings supported on solid bores in the casing. Oil seals are used on both input and output ends and there is a breather cap at the top of the case to compensate for build-up of internal pressure.

Pressed Steel Pillow Block

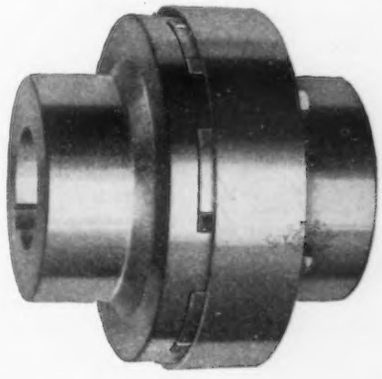
A ONE-PIECE pressed steel housing pillow block for shaft bearings of 1 1/16 to 1 5/16 in. diameter has been introduced by *Randall Graphite Products Corp.*, 609 W. Lake



Street, Chicago. The assembly consists of three parts: the steel housing, a machined cast iron spherical section with large oil reservoir, and a patented bronze bushing with graphite filled grooves. The whole unit is cadmium plated. Features claimed for this type of construction are: low cost, quiet operation, selective mounting positions, inherent self-alinement, self-lubrication and one-third less weight.

Heavy Duty Flexible Couplings

BY providing a greater number of jaws than on previous L-R types and making the bodies of cast electric furnace steel, *Lovejoy Flexible Coupling Co.*, 4979 W. Lake Street, Chi-



cago, claims to have added 80 per cent to the capacity of its L-R type H heavy duty flexible coupling. The individual load cushions are free floating between the metal jaws and rest upon the central hub, being held in place by an endless steel floating cushion retainer or collar. Three types of resilient cushioning material are available: Metalflex, a high grade brake lining material, used for transmitting heavy shock loads such as on steel

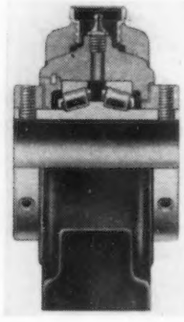
mill equipment; oak tanned belting leather, for use on sustained loads and greater misalinement, and Multiflex cushions made of vulcanized rubber duck fabric, for use on fluctuating loads. These type H couplings are made in bores from 1½ to 14 in. (5 to 3000 hp. at 100 r.p.m.).

Small Flexible Couplings

TWO new forged steel flexible couplings with 1⅛ and 1⅝ in. maximum bores respectively have been added to the line made by the *Ajax Flexible Coupling Co.*, Westfield, N. Y. Flanges are forged from SAE 1020 steel. They are specially designed for use with alloy steel shafts carrying a high percentage of their torque capacity. These two new sizes of couplings are built on the same principle as larger Ajax sizes. Rubber bushings and graphite bronze bearings provide resilient flexibility, positive drive, free end float, and eliminate noise, backlash and need for lubrication.

Roller Bearing Pillow Blocks

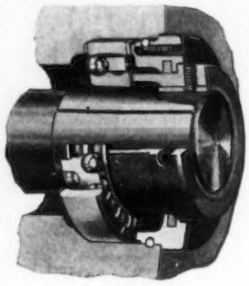
FOR simplified mounting on commercial shafting where the loads are not too severe, the *Dodge Mfg. Corp.*, Mishawaka, Ind., has announced the Dodge-Timken double interlock pillow block. This unit uses a special duplex Timkin roller bearing with long inner race extending completely through the housing and held by two special mounting collars. To secure the bearing to the shaft, two setscrews, placed 120 deg. apart in each collar, are screwed down to the shaft through unthreaded holes in the race ring, thus clamping it directly to the shaft on the side away from the setscrews.



This pillow block is made in both an expansion type, in which the outer housing is machined on the inside with a straight cylindrical bore, and a non-expansion type, in which the spherical inner member fits into the spherical cup machined into the inside of the outer member. All normal radial, thrust and shock loads are successively carried by this pillow block, but load capacity and top speed may be increased somewhat if the bearings are mounted on full size ground shafting.

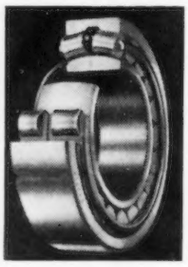
Ball Bearing Units

TO simplify the installation of ball bearings in machinery where the bearing housing is an integral part of the machine, the *Ahlberg Bearing Co.*, 3054 West 47th Street, Chicago, has developed a line of ball bearing units known as CJB Simplex machine units. They are available in three capacities, with either single or double row deep groove bearings or self-alining bearings. In the light series, the bearings are mounted directly on the shaft; in the medium and heavy duty series, a split adapter sleeve is used in a taper bore. Retaining caps are optional either in the open type as illustrated or the closed type which seals the bearing completely. A new non-drag seal made of neoprene is used in combination with a frictionless labyrinth seal. Expansion or non-expansion units are optional.



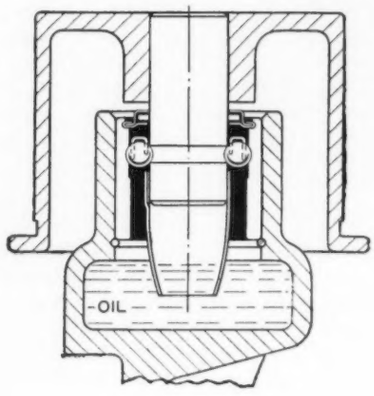
Double Row Roller Bearing

A DOUBLE row roller bearing with a self-alining inner race in sizes from 1.9680 to 5.9045 in. bore has been put on the market by *Shafer Bearing Corp.*, Chicago. The concave roller design provides self-alinement on the inner race and capacity for radial loads and thrust loads in either direction, or any combination of the two. Thrust capacity is provided through the shape and angular position of the rollers and races. Rollers are large and the design permits use of the maximum number of rollers, giving ample capacity in a compact bearing assembly.



Self-Oiling Pulley Bearing

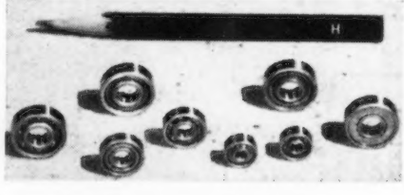
DESIGNED by *New Departure* as a vertical tension pulley bearing for textile machinery is a unique bearing containing its own oil circulating



system, designated as TP-13-500, for speeds of 3500 to 15,000 r.p.m. By this system, oil is drawn from a reservoir below the bearing and is passed in a fine spray or mist directly to the balls and races. The bearing is self-sealed and oil need be added only at yearly intervals. The bearing requires no locknuts, screws or other parts for mounting and it may be removed instantly for re-oiling. There is said to be no drag in the seals.

Diminutive Ball Bearings

DIMINUTIVE size, precision ball bearings down to ⅛ in. in bore, which have heretofore been available from the *Norma-Hoffmann Bearings*



Corp., Stamford, Conn., in the full (retainerless) type, can now be obtained from the same source with retainers or ball cages. They belong to an extra light, single row, narrow, inch size series. Bores range from ⅛ to 1½ in. and o.d. from ⅜ to 2⅝ in. correspondingly, although the truly diminutive sizes do not go beyond ¼ in. bore. They are available without side plates or with single or double dust guards.

"A.W." Quality PRODUCTS

from Mine to Consumer

Carbon, Copper or Alloy Steels—in *any* Open Hearth analysis, in *any* quantity—to meet *your* specifications . . . Welding qualities, toughness, abrasion resistance, ductility . . . There is an "A.W." Steel made to Alan Wood standards that will give you best results at the lowest possible cost.

"SWEDE" PIG IRON
Foundry, Malleable and Basic.

INGOTS
Standard and special sizes in any Open Hearth analysis.

BLOOMS, BILLETS AND SLABS
Alloy, Forging and Rerolling.

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Special Alloy, Tank, Ship, Boiler, Flange, Firebox, Locomotive Firebox, Structural and Dredge Pipe.

HOT ROLLED SHEETS
All qualities, special Alloy, Annealed, Blued Finish, Hard Red, Pickled, or deoxidized.

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For every kind of flooring condition: "A.W." Super Diamond, Standard Diamond, Diamondette, Sunken Diamond and Ribbed Patterns. Any pattern furnished in ferrous or non-ferrous analysis.

CUT STEEL NAILS
"Reading" Brand—all types and sizes.

ALAN WOOD STEEL COMPANY

MAIN OFFICE AND MILLS, CONSHOHOCKEN, PENNA. : : SINCE 1826 : : DISTRICT OFFICES AND REPRESENTATIVES—Philadelphia, New York, Boston, Atlanta, Buffalo, Chicago, Cincinnati, Cleveland, Denver, Detroit, Houston, New Orleans, St. Paul, Pittsburgh, Roanoke, Sanford, N.C., St. Louis, Los Angeles, San Francisco, Seattle, Montreal—A. C. Leslie & Co. PRODUCTS INCLUDE—Steel Products in Carbon, Copper or Alloy Analyses : : Sheared Steel Plates : : Hot Rolled Sheets and Strip : : "A.W." Rolled Steel Floor Plates : : Billets, Blooms and Slabs : : "Swede" Pig Iron : : Reading Cut Nails.

On The Assembly Line

BY W. F. SHERMAN
Detroit Editor

• Weight reductions in automobiles to cut costs being considered . . . A suggested method is to omit the floor pan from car body and incorporate it as structural part of the frame . . . One manufacturer to use this method

DETROIT — Body and frame cost reductions are currently providing important objectives for the attentions of engineers and, according to them, cost items in these parts of the automobile are exceedingly vulnerable.

Automobiles are strictly comparable on a cost per pound basis, so the reduction of poundage is the physical line of attack being followed by engineers. Extreme consciousness of poundage and cost has been responsible for interest in integral frame and body construction, for instance. However, recent thoughts on such unitary construction have indicated that, for at least the time being, the separation of body and frame is desirable. The frameless automobile, so called, has been subjected to criticism and the charge made that such construction would reduce rather than increase the engineer's control over the rigidity of the entire structure.

"Can weight be transferred from the car body to the chassis frame in such a way as to reduce over-all car cost?" asked H. B. Bartlett of Parish Pressed Steel Co., Reading, Pa., at the SAE White Sulphur Springs meeting the other day. He referred to omission of the floor pan from the automotive body and its incorporation as a structural part of the frame, presenting five "pro" arguments and five "con" arguments:

PRO	*CON*
1. Car weight reduced 10 to 15 lb.	1. Body builder might find difficulty obtaining and maintaining door fits.
2. Body labor cost cut *more than* frame labor cost would increase.	2. Some tool duplication but less elaborate tooling perhaps.
3. Frame weight up, facilitating shipping. Present light frames don't meet minimum carload weights. Freight penalties are 5c. to 28c. per unit now.	3. Service replacement cost of frame increased but not as much as in unitary construction.
4. Floor height can be lowered 1 in. to 1½ in.	4. More chassis assembly would be required from pits under assembly line, decreasing efficiency.
5. Less elaborate tools required.	5. Objectionable vibrations caused by wheel action might be set up in floor. Might be necessary to insulate occupants' feet and automobile seats from the floor.

Weighing the above considerations, Mr. Bartlett concluded that a considerable amount of development will be required before a move in this direction is advisable. However, he said that "this innovation through efficient designing could effect a saving of 25c. to 40c. a car and will, therefore, be given some future consideration." In a million-car program this would mean $250,000 to $400,000 savings in manufacturing costs; only one familiar with the innermost arguments in auto engineering departments could know how frequently 1/10 of a cent difference in cost has changed a design.

All-welded automobile frames will be incorporated in one manufacturer's cars next fall. It is easy to see how the welding of the floor pan to the frame would fit into the production plans for this type of frame. The frame fabricating industry seems to be ready for the change mentioned by Mr. Bartlett, but the question remains whether the body builders can overcome the difficulties indicated above.

Only by consideration of its difficulties does the industry make rapid strides. One of the predominating problems (indicated above and discussed more completely in the "Assembly Line" of May 16) is that of obtaining enough body frame rigidity or stiffness to take care of the torsional loads imposed on the car. However, high torsional loads on body frame combinations are themselves subject to modification by design changes, particularly in the suspension system since it is through the wheels that loads are imposed on the frame and body. A reduction of such loads through a new system of independent suspension of all four wheels with transverse leaf springs has been proposed after successful tests on a group of vehicles ranging from light automobiles to railroad trucks and heavy special purpose vehicles.

Four Semi-elliptic Springs Used

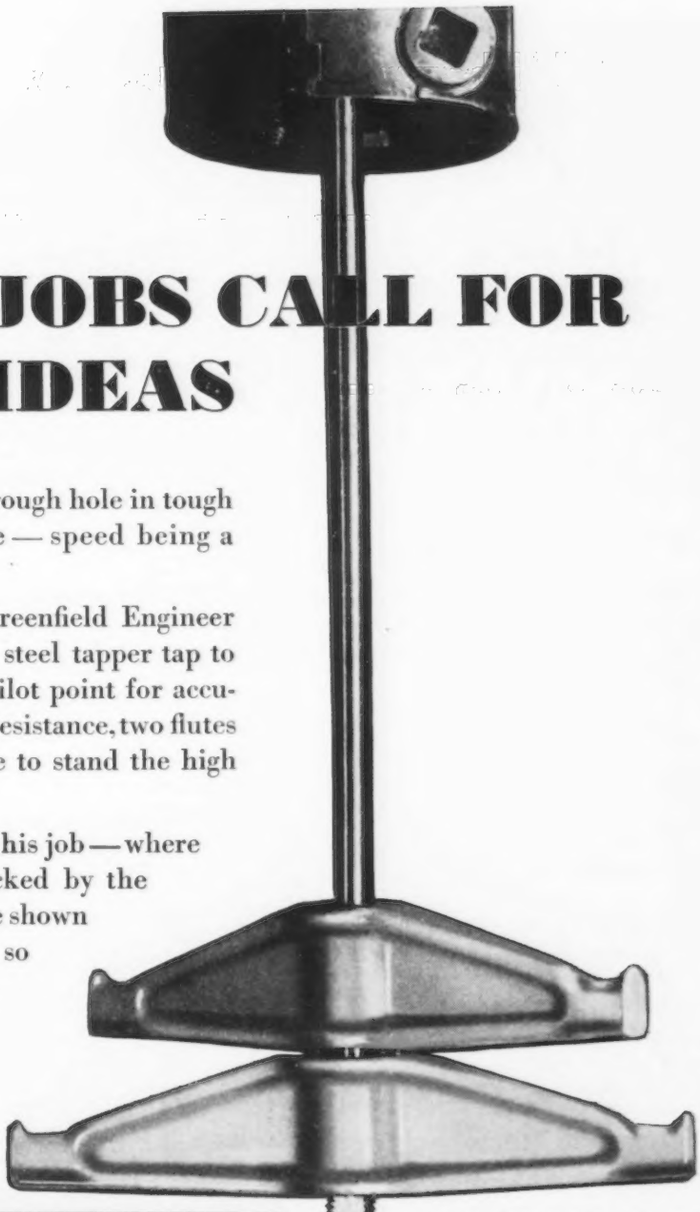
THE transverse spring arrangement makes use of four semi-elliptic leaf springs forming a parallelogram when viewed from the front or top, giving a "box-parallelogram" effect. Parallelogram action permits vertical movement of the wheels, without change of wheel camber, rather than travel on an arc in rebounding from road shock. Wheel action is entirely independent for each of the wheels, front and rear. Since the transverse springs are attached at the center of the frame crossmembers, this suspension system reduces torsional loads on the frame and thereby permits weight reduction without sacrificing rigidity that is required. The new springing system has been

TRICKY JOBS CALL FOR TRICKY IDEAS

How would you tap a deep through hole in tough forged steel parts like these — speed being a major factor?

This is the way a G. T. D. Greenfield Engineer did it. A special high speed steel tapper tap to save "backing out" time—a pilot point for accuracy, a short thread to reduce resistance, two flutes for a strong cross section able to stand the high speed and torque.

Result — no more worries on this job — where incidentally, accuracy is checked by the G. T. D. Greenfield thread gage shown in the picture. See why it is so often good business to call in a G. T. D. Greenfield Engineer?



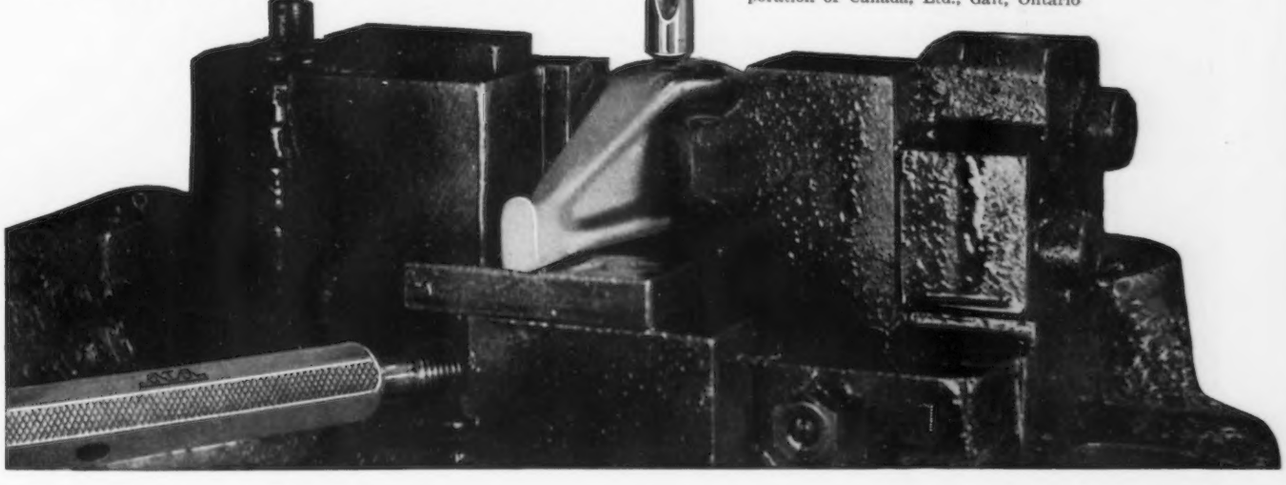
GTD GREENFIELD

TAPS · DIES · GAGES · TWIST DRILLS · REAMERS · SCREW PLATES · PIPE TOOLS

GREENFIELD TAP & DIE CORPORATION

Greenfield, Massachusetts

Detroit Plant: 2102 West Fort St.
Warehouses in New York, Chicago, Los Angeles and San Francisco
In Canada: Greenfield Tap & Die Corporation of Canada, Ltd., Galt, Ontario



designed by a Los Angeles research organization, Lundelius & Eccleston. This group is currently demonstrating to automobile industry executives a car equipped with this leaf spring type of independent suspension.

Application of forces at the center of frame crossmembers, front and rear, is in contrast to present American independent suspension systems in which coil springs impose wheel loads at each of the four corners of the frame. Coil springs in general are mounted about 20 in. off the centerline of the frame so loads on individual wheels cause twisting of the frame. Also, centrifugal forces in turning a curve in the road result in throwing car weight to the outside of the car on the curve. This depresses the outside springs more than the inside ones and twists the car frame. Because the torsional stresses are transmitted to the body and, in part, resisted there, extra strength, rigidity and weight are required in the body as well as in the frame. Thus the interest in anything that will reduce frame-body torque.

More Attention to Leaf Springs

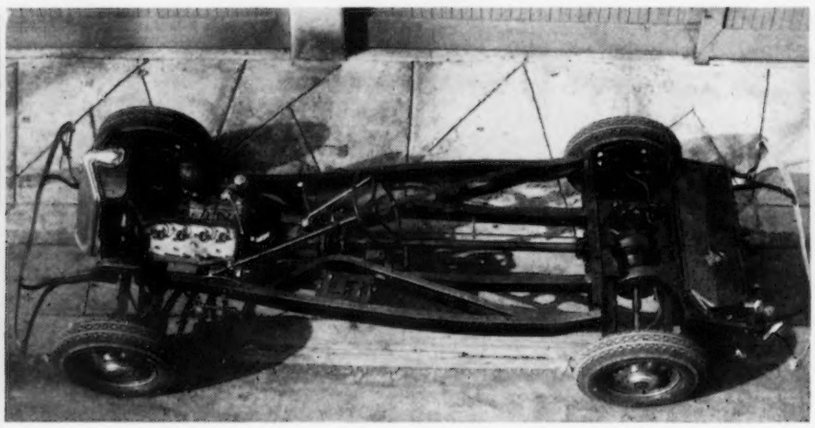
IT seems not to be generally known, but an important reason for popularity of coil springs is the fact that leaf spring designers a few years ago could not quite meet the degree of softness demanded by auto designers. However, now the leaf spring industry is pressing for reconsideration of its product and a lot of attention is being paid to the leaf spring again by auto builders. The so-called progressive spring which can be made to increase its stiffness at almost any desired rate has come into the picture, along with other technical improvements in leaf spring design. There are now frequent assertions of faith in the return of some sort of leaf spring suspension.

While the low-torsion possibilities of leaf spring installations are attracting a great deal of attention, there are a number of other arguments that appear to the onlooker to be as good, or better. For instance, coil spring types of suspension make use of a large number of parts which are expensive to manufacture. An engineer has pointed out that the enclosed coil spring on some lines of cars makes use of 20 forged or stamped parts for each front wheel, plus a drawn tubular member in which the suspension units are mounted at either side. These do not include the shock absorber units. Seventeen of the 20 parts require accuracy of machining to preserve something like proper wheel alinement. One of the open coil spring suspensions has approximately 26 forged or stamped parts for each front wheel, plus an extra-large cross member and a large stamping riveted to the crossmember as a base to which the lower wishbone assemblies are anchored. Of these 26 parts 19 require accurate machining.

The transverse spring parallelogram suspension appears at first glance to be more complicated than the coil spring suspension but Melvin N. Lefler, engineer, who is demonstrating it to the industry now, says that there are only 10 forged parts for each front wheel in this type of suspension, and no stampings. The center mountings for the springs are forgings of a simple design.

Regarding frame twist and the weight reduction effected by decreasing torsional stress, it is claimed that one car using coil suspension showed an increase of total weight of approximately 240 lb. over previous orthodox axle construction. On the other hand, a 4 per cent reduction in total weight (approximately 118 lb.) and a 28 per cent reduction in unsprung weight have been effected in a similar small car with parallelogram leaf spring supports for the four wheels.

While Mr. Bartlett spoke at White Sulphur Springs proposing that the floor pan be attached to the frame, it was learned authoritatively in the Mid-West that Nash is already planning exactly this feature for its entire line of 1941 cars including the 112 in. light six-cylinder car.



INDEPENDENT SUSPENSION of all four wheels with leaf springs is new to the American automotive industry. It has been applied to this standard automotive chassis with considerable savings in weight, cost and car wear-and-tear. This suspension used three leaf springs in front and four in the rear, providing parallelogram action on each wheel so the wheel travel is vertical rather than on an arc. This suspension system has been applied successfully to movie camera booms and railroad trucks and is proposed for various ordnance requirements. Designers are Lundelius & Eccleston.

Washington

BY L. W. MOFFETT
Washington Editor

· Administration shows concern over possible Fifth Column activities but shows no sign of relaxing laws giving employers more freedom in hiring and discharging of employees. Manufacturers still fear NLRB penalties.

WASHINGTON—The Administration, moving forward with its national defense program, shows increasing concern regarding fifth column activities. Yet it is apparently the studied plan that the Government alone keep a check on espionage, sabotage and other practices designed to hinder military preparations. Consequently it appears that there is no present intention of relaxing laws or regulations which would give employers more freedom of action in hiring and discharging employees. Industry has been made decidedly conscious of what this implies. It has already paid heavy penalties at the hands of the National Labor Relations Board which under the charges of "unfair labor practices," "discrimination against union workers" and related claims has compelled reinstatement of strikers with back pay and otherwise exercised severe restrictions in the name of the Wagner Act on employer functions.

Reports coming to Washington are to the effect that as a whole employers, fearing the heavy hand of the Government, are loath to take adequate steps for plant protection against sabotage, slowing down of work or other acts to hamper production. In the absence of relaxed restrictions it is said that about the only precaution industry generally is exercising consists of a closer scanning of employment rolls. Even here there is said to be a hesitancy to act or to report suspected employees to the Government for fear of charges of efforts to break down unionization.

No Irresponsible Hunts for Spies

THERE is general agreement that no source should be permitted to organize widespread, irresponsible witch hunt for "spies," but it is felt that instructions of Attorney General Jackson narrow the fifth-column policy too much. They have been told to discourage creation of volunteer counter-espionage groups and likewise to assure protection for the civil liberties—a broad, intangible term—of "loyal and innocent citizens and aliens."

All tips and information regarding sabotage, subversive action and "similar machinations," Mr. Jackson told the attorneys and marshals should be given at once to local agents of the Federal Bureau of Investigation. The G-Men then would investigate and if Federal laws seem to have been violated, reports would be made to Federal attorneys preparatory to prosecutions. It would still be necessary, except "in cases of emergency," for the Government attorneys to get Department of Justice approval prior to prosecution. In turn Department approval would depend upon the advice of the recently organized neutrality laws unit, which, it was stated, would furnish "prompt action."

The Attorney General said he would welcome cooperation from citizens in presenting information to the FBI, but he specifically requested that they refrain from any independent investigations. Instead he asked that they submit the information at once.

"Certain individuals and groups may offer their active cooperation and propose the formation of volunteer associations and citizen counter - espionage units," Mr. Jackson instructed the attorneys and marshals. "Counter-espionage activity by individuals or groups, without official status or responsibility, and the unauthorized assumption of any investigative functions by such groups should be discouraged.

"The cooperation of your office is requested to see to it that in no instance should any representative of your office directly or indirectly place the department in the position of approving, encouraging or sponsoring activity of an investigative nature upon the part of any individuals or organizations.

"While it is important that those engaged in illegal acts hostile to the best interests and welfare of the American people be promptly detected and the country protected against their activities, it is equally important that the civil liberties of loyal and innocent individuals be not invaded. Care should be taken to assure aliens of complete and friendly protection under the law.

"The law enforcement officers of the Federal Government have important responsibilities in helping to maintain a reasonable and healthy attitude on the part of citizens of this country and in the turning of their energies and patriotism into useful and efficient channels."

Knudsen-Ford Talks Preliminary

POINTING out that their discussion here on Tuesday of last week was only preliminary, William S. Knudsen of the National Defense Advisory Commission and President Edsel Ford of the Ford Motor Co. said that actual production schedules of designs of engines to be produced by the Ford Co. had not been decided upon. Construction of airplanes, it was stated, was not discussed. Mr. Ford explained that his company was prepared to enter upon mass production of engines as soon as contracts are awarded by the Government.

His statement that consideration is being given to the production under license of the British Rolls-Royce Merlin engine, released to the United States Government, led to unconfirmed reports that the Ford Co. had been given production rights to this 1800 hp. engine. It is a liquid-cooled type. If such production rights have been given the Ford Company they of course would not be exclusive.

At the same time Mr. Ford said that the Army's Curtiss P-40 pursuit plane had been examined by company engineers and found to be suitable for mass production. This plane is powered with the Allison liquid-cooled engine, which is manufactured by a General Motors subsidiary. The Allison engine has approximately 1100 hp. Both Mr. Ford and Mr. Knudsen declined to say whether General Motors, from which he is on leave of absence as president to assume his present Government national defense job, will release the Allison engine to the Ford Co.

Henry Ford has said that examination made of the P-40 has led him to revise upward his original estimates that the Ford Company could turn out 1000 planes daily. This estimate is said to have been based upon experience of the Ford Co. at its Dagenham, Essex, England, plant which is reported to have gone into quantity production of a recently designed airplane engine.

The conference with Mr. Ford was one of a series that has been held and will be held with automobile manufacturers who are studying plans looking to the production of airplanes and airplane engines.

U. S. Plans Large Purchases Of Strategic Materials

Washington

• • • **With $147,500,000** appropriated for the fiscal year beginning July 1, and an additional $112,500,000 authorized, the Government is preparing to enter upon a huge program for purchase of strategic materials. Their acquirement is under direction of Edward R. Stettinius, Jr., in charge of the raw materials division of the National Defense Advisory Commission. Actual purchases will be made through the Treasury Department's Procurement Division Strategic Minerals Section, headed by W. S. Leaycroft. Preparatory to engaging upon its enlarged program, the section has increased its personnel and moved into larger quarters.

Looking to the production of ferromanganese from domestic low-grade manganese ore, one of the important strategic minerals, a $150,000,000 supplemental national defense appropriation bill carries a provision offered by Representative J. G. Scrugham, Democrat of Nevada. It places at the disposal of the President $2,000,000 which he may make immediately available to the Bureau of Mines for the erection, equipment and operation of a pilot plant for the beneficiation of manganese ore and the production of metallic manganese by the electrolytic process. It is understood that the plant would have a capacity of 50 tons daily, using the same process and having the same capacity as a privately owned plant at Knoxville, Tenn. Provision also is made in the legislation for use of the funds in the exploration of manganiferous deposits.

Federal Loan Administrator Jesse H. Jones has said that the Reconstruction Finance Corp. will lend between $100,000,000 and $250,000,000 to corporations for the purchase of stockpiles of strategic raw materials, authority for which is granted in a bill before Congress.

No breakdown has been announced as yet regarding the amounts of each of the strategic materials which the government will purchase but that minerals will be bought in large quantities is well known. Among them will be such products as tin, manganese, tungsten and chrome ores. For the purchase of strategic materials the War Department was given an appropriation of $66,000,000 and an authorization of an equal sum, the Navy Department an appropriation of $34,000,000 and an authorization of a like amount and in a supplementary national defense bill is carried an appropriation of $47,500,000.

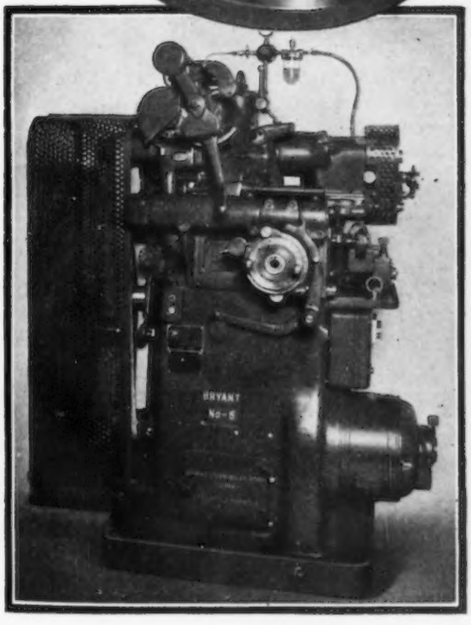
THE BULL OF THE WOODS — BY J. R. WILLIAMS

INTERNAL *Cam* GRINDING

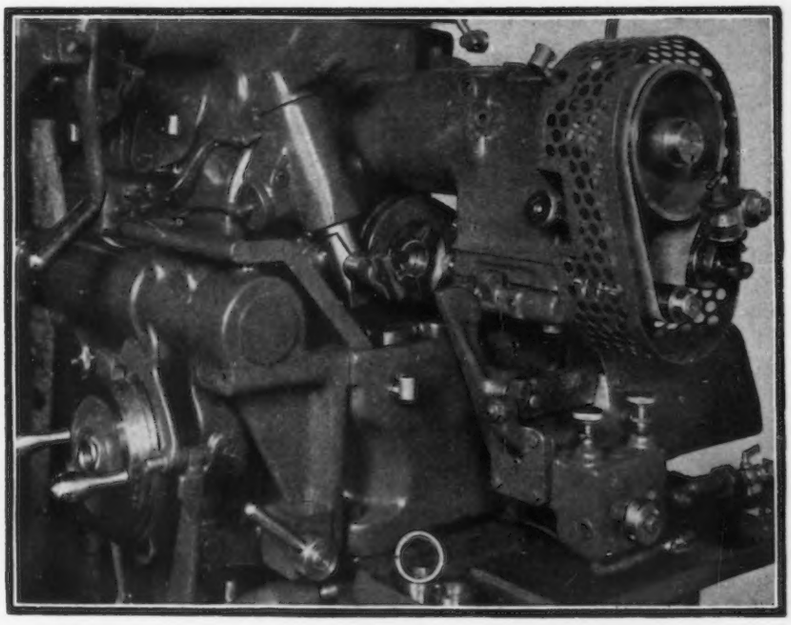
ANOTHER PRODUCTION ASSET AVAILABLE ON THE BRYANT No. 5 GRINDER

THE No. 5 Bryant Internal Grinder, with cam grinding attachment, is one of the most versatile machines offered to the industry today for grinding the bore on small parts. Straight, taper, out-of-round, and cam shaped holes (or any of these in combination) may be ground on this one machine in one set-up. The ability to grind these shapes, plus the Bryant feature of wheel suspension means absolute accuracy, fine finish, quick set-ups, no rehandling, and an increase in production that should interest all modern cost-conscious manufacturers.

Complete details on the Bryant No. 5, plus hints on handling a variety of internal grinding jobs, will be found in the Bryant No. 5 Catalog. Your copy will be sent on request.



No. 5 Bryant Internal Grinder



Close-up of work showing Cam Grinding Attachment

BRYANT CHUCKING GRINDER CO., Springfield, Vermont

Fatigue Cracks

BY A.H.DIX

Stoic Finds Ray of Sunshine

• • • "At least," writes A.W.M., *"you didn't call it 'Shop Torque.'"*

Like new wallpaper, it won't be so bad once you get used to it, but *"Fatigued Cracks"* might have been better.

Lump of Sugar

• • • Thought perhaps you should be told that this secretary looks forward to Thursday morning's mail (I even begrudge holidays delaying IRON AGE's arrival).

Mr. Van Deventer's editorials are the most interesting and most informative I have ever read anywhere. You know it would be rather nice from the feminine standpoint if sometime you ran a picture of Mr. Van D. with an article telling what he is like, what he likes to do, and a little bit about his family.

(Sgd) *Probably the only girl in the Crouse-Hinds Co., Syracuse, N. Y., who is one of your readers."*

What he is like: John Herbert Van Deventer, editor-in-chief and president of THE IRON AGE, is quiet, soft-spoken, imperturbable, as easy as a 10½-D shoe on a 10-C; low Brinell case, tough core. Never rushed; never rattled. If you should walk in on him in the midst of an editorial, with the deadline 20 minutes away, you'd never know it.

What he likes to do: Work with his hands; has several successful machinery patents to his credit; skilled woodworker; paints on a large scale—fences, houses, etc. No golf, no bridge. Current hobby, photography.

A little bit about his family: Married, lives in Yonkers, N. Y. Nine childern, five boys, four girls, youngest 13 years.

• • • **General:** Excellent public speaker—21 speeches since first of year; in great demand, dated far ahead. Proved that editorial page can be made the spearhead of reader interest. Types editorials on a Remington Noiseless, using the conventional two-finger h. and p. system.

Just a Simple Operation

• • • While such a steel may be quite satisfactory for other purposes, it cannot be made "normal" for carburizing without remelting.—*The Iron Age.*

Oh, is that all?

All But One Ignored Us

• • • No Gallup investigator has ever rung our bell. No one has ever telephoned to ask if we just listened to the Krispee Krackled Kornflakes half hour and how was it? No *Inquiring Reporter* has ever asked us whether the husband or the wife should horsewhip the children. The world doesn't know whether we prefer a skid to a blowout, soap to shaving cream, canned beer to bottled, or nightshirt to pajamas.

If we had not participated in the *Literary Digest's* last straw vote—the one that went sour on an epic scale—we would think that no one cared. But the chances are that you have no reason to complain of neglect, for advertisers who sell to industry are continually sending out questionnaires asking which trade papers their customers read.

A few cynics, it is true, view the reader-interest questionnaire with jaundiced eye, holding that those who gaze raptly at the callipygous curves in *Pic, Click* and *Film Fun* are likely to mark X's opposite the *Atlantic, National Geographic* and *Christian Advocate.*

Even though there may be something to this contention, it is comforting to know that in 69 reader-interest surveys made by industrial advertisers your favorite family journal Abou Ben Adhemmed 54 times. In one we saw the other day we had 46 per cent more X's than the runner-up.

And Dash of Bitters

• • • Mrs. Perkins states there are six million unemployed all ready in a short time to jump into armament production. This is all bosh. Even now the kind of employees needed, such as machinists, toolmakers, cannot be found and it takes years to make them.

Because of this mistaken idea, which is criminal to follow now, all government plants of the War Dept. are to be allowed to work the men only 40 hours a week, and working the arsenals 6 days or more a week to take on additional men in order to "stagger the work." A moment's thought will show that the production schedule will be staggered sure enough by any such scheme. How can you get more than one stretch of work of 40 hours in a 7-day week, limiting work to 8 hours a day for each man?

Even if we had the trained men this would be a ridiculous scheme. The only possible way of course is to stretch the week out for a given shift to 46 or 56 hours a week.

Ordnance Plant Employee.

Blurb

• • • When we were in our nook in the back we used to be able to brag to our heart's content but up in this rarefied atmosphere we are afraid our style will be cramped. So just to keep our hand in we will blurb that in May over 600 newcomers joined the big, more or less happy familly—a new, all-time high.

Puzzles

Last week's conductor rode 3½ miles.

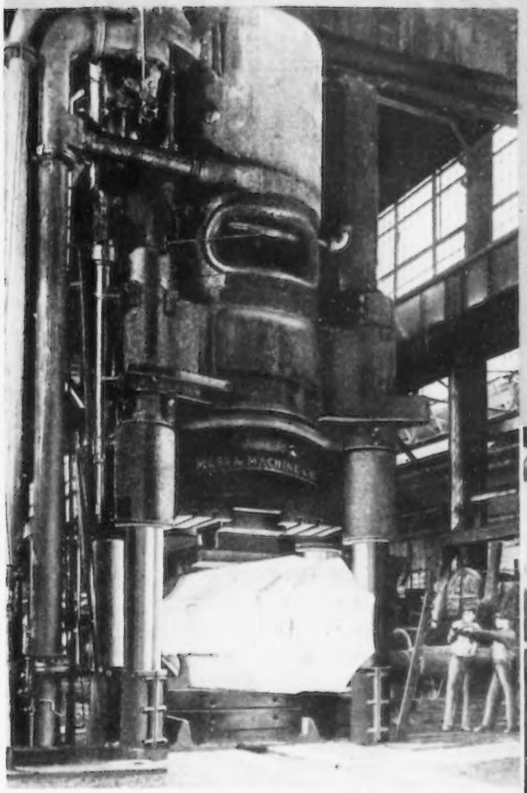
George (Gilbert & Barker) Benoit yawned off the June 6 bridge problem in two minutes. H. M. Oshry stumped the experts with his alienist's sales promotion piece about an elliptical field, major axis 1000 ft. and minor axis 500 ft., with stake at one end of minor axis. If you lie awake nights wondering how long the tether should be to permit a goat to graze only half the field, wire collect.

Three minutes for this one without pencil or paper entitles you to a summa cum laude:

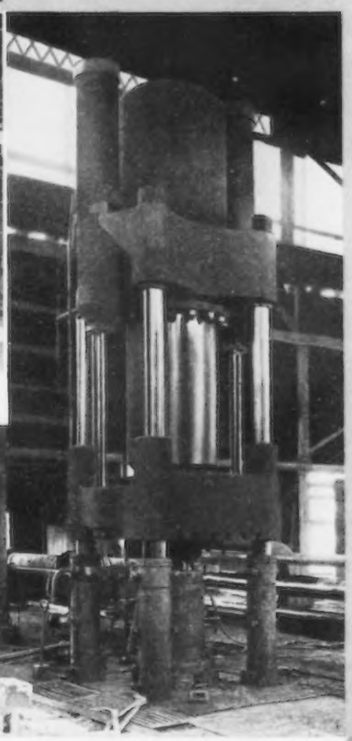
If five cats catch five rats in five minutes, how many cats will be required to catch one hundred rats in one hundred minutes?

—A.H.D.

PRESSES
Built by
MESTA



2,000 Ton Steam Hydraulic Forging Press



700 Ton Hydraulic Piercing Press

PRESSES

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Forging, Bending,
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Available in Sizes
Ranging from 150 Ton to
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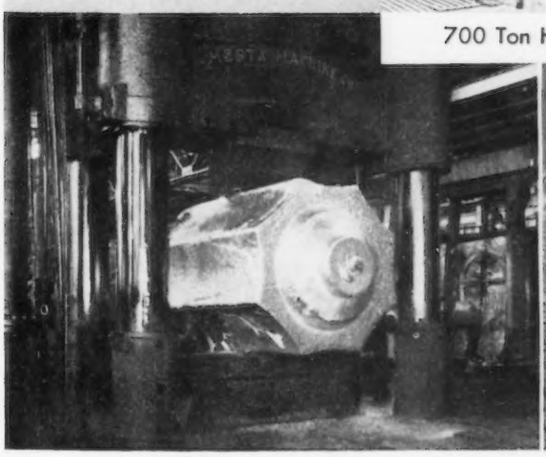
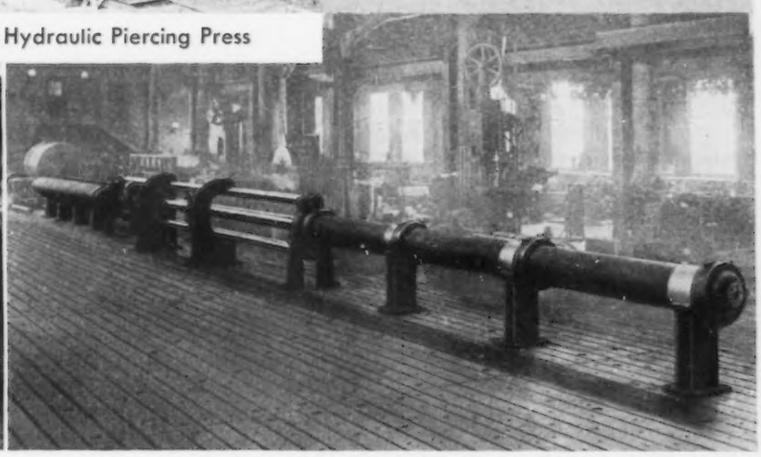


Forging 58" Ingot



Mesta Draw Bench

MESTA MACHINE COMPANY · PITTSBURGH, PA.

News of Industry . . .

Steel Expands In South Africa

• • • **A further expansion** of the South African iron and steel industry is now under way and will raise the total capacity of that country to 750,000 net tons annually, according to information sent to THE IRON AGE by R. W. Osborn, South African Iron & Steel Industrial Corp., Pretoria.

"Were it not for the fact that our own steel production today exceeds in tonnage the imports for so recent a year as 1933, our industry and our economic condition would be in a very poor state," Mr. Osborn writes. "With the turmoil in Europe, supplies of iron and steel from there would obviously be extremely hard to obtain and at best subject to extraordinary delays. America, it is true, could still supply our needs, but even American steel production is approaching its capacity limit due to the war in Europe. While American steel prices compare favorably with European prices before the war, the shrinkage in the South African pound in relation to the dollar makes American prices higher per ton today."

Important extensions at the Iscor (South African Iron & Steel Industrial Corp.) plant include a duplication of existing coke producing capacity, modernization of existing by-products plant, a new bessemer plant to produce 100,000 tons of ingots a year and a new wire works for production of all commercial grades of steel wire.

Although South African steel production has been increasing in recent years, imports have not declined, but on the contrary have risen along with the industrial progress of that area. In 1933 South African imports of steel were 340,100 net tons; in 1937 they were 542,128 net tons, and in 1938 the total was 517,674 tons. In 1939 South African production totaled 346,097 net tons.

GEORGE S. ROSE is the new secretary of the American Iron and Steel Institute, succeeding Walter S. Tower, newly-elected president. Mr. Rose, a Pennsylvania State College graduate in 1923, associated at various times with Alan Wood Steel Co., Crucible Steel Co. of America and American Steel & Wire Co., joined the institute staff in August 1934.

Ceramic Supplier Will Erect New Building

Pittsburgh

• • • **Approximately 60 acres** of ground at Pulaski, Pa., has been purchased by O. Hommel Co., important ceramic supplier, as a site for a new building for manufacture of frit. This latest addition to be built as a result of increased business completes an expansion program which included a large new warehouse and an addition to the office building.

Increase Sought In Toluol Supply

Pittsburgh

• • • **With toluol production** at capacity in this country, it has been learned on good authority that available supplies would hardly more than satisfy the requirements of the U. S. Government armament program and demand from the Allies.

At present, domestic users of toluol, a prime necessity in the manufacture TNT, are being taken care of by the nation's producers with excess amounts being shipped to the British who have for months been short of this material.

Since toluol is a by-product of coke production, and since every by-product coke plant in the country is operating at capacity, there is little chance of an increase in total supplies in the near future.

As a possible way out, in case of extreme emergency, considerable progress has been made recently by oil companies who have succeeded in producing toluol by a cracking process. However, amounts so produced are small, and the cost is higher than the current price level of regularly manufactured toluol.

Furthermore, if the nation's steel mills should be forced to increase to a greater degree the amount of low volatile coal utilized in order to increase the yield of by-product coke, a parallel decrease in the production of toluol will result, as less of the latter is obtained from the distillation of volatile coal than results from the use of regular coking coal.

Suggestion is being made in some circles that it may be necessary for this Government to explore the feasibility of utilizing picric acid as an explosive base, thus supplementing available supplies of TNT. A picric acid base utilizes benzol, a by-product, which is produced in about five times as great an amount as toluol.

Toledo Still Short of Tool and Diemakers

Toledo

• • • **Steadily growing demand** for diemakers in the Great Lakes industrial area is reflected here in the fact that more than 1000 tool and diemakers in Toledo are now employed, about 100 have been called here in the last month, and still there is a shortage.

Plants are rushing to completion the tooling required for new 1941 models of motor cars and also getting busy with rearmament business. Industrial organizations are making a complete check of citizenship of all employees preparatory to taking of government contracts.

John D. Biggers, president, Libbey-Owens-Ford Glass Co., who two years ago made the nation's unemployment census and established an economy record in doing it, has been named executive assistant to William S. Knudsen, president, General Motors Corp., now directing the industrial mobilization for armament. Mr. Biggers will have charge of all munitions production.

SWOC Chapter Attacks Fifth Column, Trojan Horse

Pittsburgh

• • • **The Steel Workers** Organizing Committee, lodge 1276, of Crucible Steel Co. of America's Park works, has adopted a resolution pledging the unions' cooperation to the national defense program and opposing "all movements or activities of a subversive character, Trojan horses, or fifth columns which are aimed at our democratic institutions."

Cliffs Corp. Acquires 16,449 Republic Shares

Cleveland

• • • **Cliffs Corp.** has increased its holdings of Republic Steel Corp. stock by acquiring at public auction a block of 16,449 common shares for $261,127, or 15⅞ a share. The purchaser had held the shares as collateral on a note made 10 years ago by Cyrus S. Eaton.

Here is a view of the historic North works of the North Chicago Rolling Mill Co., Chicago, where the first steel rail in the United States was rolled on May 24, 1865. The site is now occupied by the Scully Steel Products Co.

Standard Steel Works To Be Baldwin Division

• • • **Standard Steel Works Co.,** Philadelphia, owned by Baldwin Locomotive Works, will be operated hereafter as the Standard Steel Works division of Baldwin without change in location, policy or personnel, Charles E. Brinley, president of the Standard company, announced.

Allegheny Ludlum Rolls 64x64-in. Silicon Sheet

• • • **Largest silicon steel** sheet ever rolled, according to Allegheny Ludlum Steel Corp, has just been produced at the company's Brackenridge, Pa., plant. Up to now, men on the rolls have been reluctant to tackle a sheet of this size—64 x 64 in., 29 gage.

Coming Meetings

June 24 to 28—American Society for Testing Materials, 43rd annual meeting, Atlantic City, N. J.

June 25 to 29—Production and Machine Tool Show, Cleveland.

July 22 and 23—Institute of Scrap Iron and Steel, mid-year meeting, Buffalo.

Sept. 24 to 27—Association of Iron and Steel Engineers meeting and exhibition, Chicago.

Oct. 21 to 25—National Metal Congress, Cleveland.

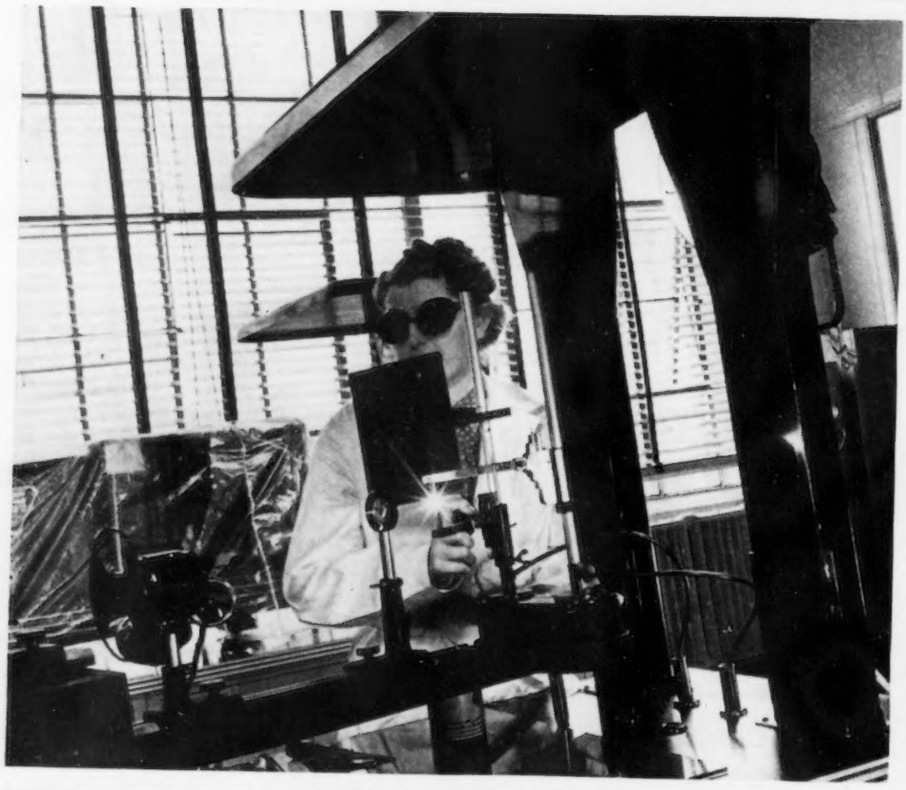
New Standards Planned For Electric Drills

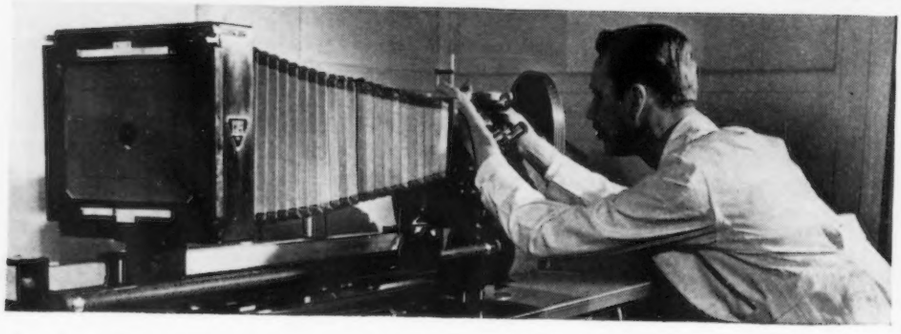
Washington

• • • **The Bureau of Standards** has invited interested parties to attend a conference in Chicago on June 26 to consider commercial standards for portable electric drills as proposed by the Electric Tool Institute. Designed to provide a nationally recognized standard, the proposal provides minimum specifications for heavy-duty and standard or light duty electric drills manufactured in 11 standard sizes ranging from 3/16 in. to 1½ in. and covers design, construction, minimum full-load ampere rating for each class and size of drill; tests; nameplates; and a uniform method of certifying compliance with the standard.

Westinghouse Quadruples Welding-Rod Production

• • • **The world's most** modern plant for production of coated rods for electric welding is expected to start operation at the Westinghouse Electric & Mfg. Co.'s East Pittsburgh, Pa., works early in July, the company announces. Employing up-to-date facilities for quality control and rapid production, the new plant will have a capacity about four times as great as the previous output level.





Italy Lacks Raw Materials, Uses Half Its Steel Output for Arms

• • • **More than half Italy's** steel output in recent years has been consumed in manufacture of munitions, airplanes, fighting tanks and warships and a steadily declining amount of steel has gone to peace industries.

While ingot production since has gained somewhat, Italy produced only 2,322,000 metric tons of steel in 1938, importing 14,400 metric tons in that year. In 1929 a total of 2,122,000 metric tons of ingots was produced, the relatively small increase in the ten years being partly due to lack of domestic raw materials.

Output of Italian iron mines, the largest being on the island of Elba and at Cogne in the Val d'Aosta, for some years has represented about one-fourth of that required for Italy's steel industry. Another 10 per cent of the iron is derived from treatment of pyrite ash in electric furnaces. Considerably more than half of Italy's steel is produced from scrap. In 1938, total imports of scrap, according to the U. S. Bureau of Mines, were 604,000 tons, of which the U. S. supplied 407,000 tons and Switzerland 52,600 tons.

Shortages of all leading raw materials going into steel manufacture have hampered Italy's preparedness for war. None of the important alloys used in making special types of steel are produced in Italy or appear to have been imported in substantial quantities in recent years. Two small groups of mines in Italy produce a high-grade coal, that of La Tuille in the Piedmont and that at Seni in Sardinia, the total output being somewhat less than 100,000 tons. The country depends almost entirely on imported coking coal for the iron and steel industry, annual imports amounting to around 13,000,000 tons, most of which has been shipped from Germany and Great Britain by boat plus a small tonnage from Poland by rail. In the last six months an increasing amount of coal has been shipped from Germany to Italy by rail. There are 14 blast furnaces in Italy, with daily capacities of 200 to 350 tons of iron.

ZEDER, SKELTON and BREER—Chrysler Corp.'s famed automotive engineers—this month opened at Detroit two engineering buildings which contain 94 laboratories and test rooms, provide working space for 2000 Chrysler engineers and other specialists, and, in many ways, signal the opening of the scientifically produced automobile (as contrasted with the "assembled" cars of the past). This page (opposite) of Iron Age news photos shows (at the top l. to r.) Owen R. Skelton, Chrysler director of engineering design, Fred M. Zeder, vice-chairman of the board, Karl Breer, director of engineering research. Other photographs show Chrysler's art department, where strangers are barred, and its setup for photo-micrography. The new buildings permit doubling of the company's engineering equipment.

Here Are Latest Data On Exports to Italy

Washington

• • • **Italy's entrance** into the European war, subjecting Italian imports and exports to the British blockade and adding the Mediterranean to the European combat zone from which American ships are banned, focused attention this week on these figures compiled by the Department of Commerce, covering United States exports to Italy:

Iron and steel products (includes pig iron, plates, plain shapes, bars, and black sheets)—9085 tons in 1938; 19,593 tons in 1939; 14,250 tons January through April, 1940.

Scrap iron and steel—434,717 tons in 1938; 425,896 tons in 1939; and 204,045 tons January through April, 1940.

Machine tools and other metal-working machinery—$3,717,377 in 1935; $1,660,207 in 1937; and $770,880 in 1939. Italy is No. 12 on a list of important foreign purchasers of American metal-working machinery.

Scrap Exports Rise to 221,152 Tons in April

• • • **At 221,152** gross tons, valued at $3,575,940, the export trade in scrap in April registered an increase over that of March when shipments had amounted to only 206,928 tons, valued at $3,387,037, according to the Department of Commerce. The leading purchaser of scrap in April was the United Kingdom with total takings of 77,160 tons. Following was Italy with 74,459 tons; Japan, 38,421 tons, and Canada, 20,710 tons.

Ohio Companies Clear Way For Increased Business

Toledo

• • • **Two Toledo industries** moved to get into more favorable financial set-up to handle current business. The American National Co., important unit in metal wheeled goods industry, with orders up 44 per cent over a year ago, moved for a capital reorganization under the Chandler act. The Standard Electric Stove Co. was sold to Lewis Goldsmith and Associates, Cincinnati, and will continue operations.

Roosevelt Authorizes Study of Labor Costs

Washington

• • • **Technological advances** and their effect upon labor, treated exhaustively by the Temporary National Economic Committee at public hearings in April but since pushed to the background in the wake of the defense program, was temporarily revived last week when President Roosevelt signed a bill authorizing the Bureau of Labor Statistics to conduct a $100,000 study of productivity and labor costs in industry.

Allies to Obtain Surplus War Materials Through U. S. Steel

• • • **Purchase of $37,600,000** of surplus war supplies from the U. S. Government for resale to the Allies has been announced by U. S. Steel Corp., a transaction in line with the Government's policy of providing assistance to the Allies.

The purchase of war equipment, made through U. S. Steel Export Co., a subsidiary, was not described in detail in a corporation statement which follows:

"The U. S. Steel Corp. tonight (June 11) confirmed the preliminary announcement recently made from Washington as to the conclusion of negotiations with the United States Government for the purchase by the United States Steel Export Co., a subsidiary of the U. S. Steel Corp., of various surplus munitions, equipment and ordnance supplies now held by the U. S. War Department.

"The negotiations for this purchase were initiated a few days ago by the U. S. War Department. The purchase price of the articles so purchased is $37,600,000, representing the present value thereof as determined by the U. S. War Department.

"These articles are being resold forthwith by the United States Steel Export Co. to the Anglo-French Purchasing Board at the exact cost thereof to the U. S. Steel Export Co.

"It is contemplated that a part or all of the purchase price to be paid by the U. S. Steel Export Co. to the U. S. Government will be paid through the subsequent delivery to the U. S. War Department of new munitions and ordnance supplies of a character needed for the National Defense Program and to be specified by the U. S. War Department."

New Rust Proof Nail Said to Outhold Screw

• • • **A new rust-proof nail** of new design, developed for the boat-building industry, is said to have revealed in a series of tests properties which indicate its value for a wide range of industries where corrosion is encountered. In a demonstration for naval architects at City Island, New York, shipyard of Henry B. Nevins, Inc., it is said to have outheld a screw. The nail is made of Monel and its holding power is derived from a series of sharp annular rings rolled-on in manufacturing operations.

BELIEVED SUPERIOR to other planes of its type in use anywhere in the world, this Vought-Sikorsky shipboard fighter, model XF4U-1, will soon be turned over for Navy tests. The plane is a single-place, single-engine, all metal monoplane, with a fuselage of monocoque construction employing spot welding, and with monocoque all-metal tail surface construction. Its engine is an 18-cylinder Pratt & Whitney R-2800 two-row radial air-cooled type, rated 1850 hp.

Contracts Awarded for Submarine Machinery

Washington

• • • **The Navy Department** last Thursday announced awards aggregating $9,368,287 for propelling machinery for submarines. The awards were:

General Motors Corp. (Diesel Engine division)—machinery for three submarines to be built by the Electric Boat Co., Groton, Conn., $2,317,857. General Motors, Cleveland, machinery for three submarines, $1,406,450. General Motors Corp., machinery for one new submarine tender allocated to the Mare Island, Cal., Navy yard, $1,358,169.

Fairbanks Morse & Co., Chicago, machinery for three old submersibles allocated to the Portsmouth, N. H., Navy yard, $2,850,460. Fairbanks Morse & Co., propulsion for two submarines allocated to the Boston Navy yard, $1,435,350.

Thomas J. Quinn Celebrates 50 Years With W. F. Potts Co.

Philadelphia

• • • **Thomas J. Quinn,** president of W. F. Potts Son & Co., warehousemen of Philadelphia, celebrated 50 years of active service in the warehouse business at a reception in his honor at the Broadwood Hotel, Philadelphia, on June 12.

Mr. Quinn entered the service of the company he now heads on June 12, 1890, as a stenographer. He had served "at every desk in the office" until assuming the presidency in December, 1939.

Coke Shortage Held Possible

Pittsburgh

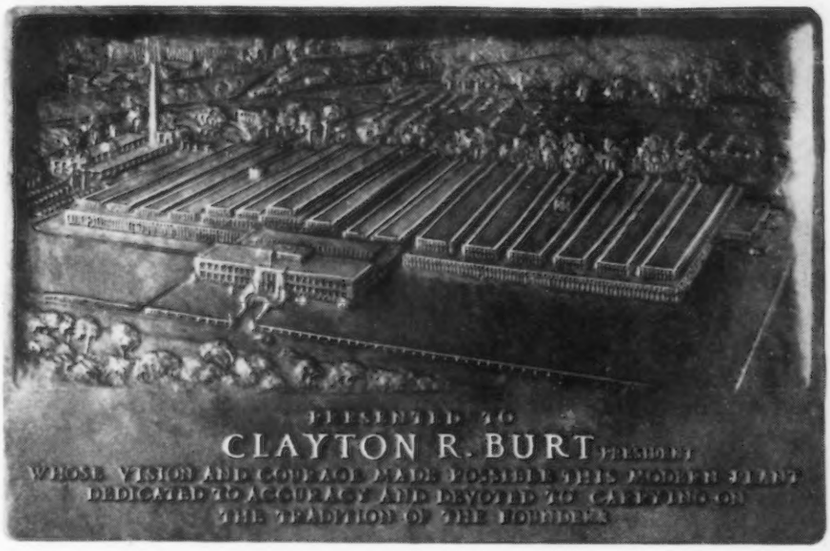
• • • **Attention is being focused** on the extent to which beehive coke producers in the Connellsville, Pa., region can take care of potential coke shortages now that two large steel companies have begun to supplement their by-product supplies with beehive coke.

Practically every by-product coke plant in the country is running at full capacity, with little or no chance of increased production except by using more low volatile coal.

At present there are about 2000 beehive coke ovens in operation in the Connellsville region, with the possibility that as many as 5800 could be put into action on short notice. Reliable quarters, however, insist that no further additions will be made unless higher prices are obtained.

It is said that maintenance and renovation expense which was incurred last fall when over 5800 ovens were in operation to supply extra needs of steel mills, was substantial. It is said, however, that there is no chance of a runaway market and some sources look for prices no more than $1 a ton above current quotations of $4 to $4.25 on furnace coke.

Available beehive coke probably would take care of a 100 per cent steel ingot rate, but if operations would go higher than that a possible bottleneck might result. Some steel makers are getting around such a situation by using an increasing amount of high volatile coal in making by-product coke which increases the yield in both coke and pig iron production. A greater use of blast furnace scrap in some instances is also expediting and raising the yield of pig iron, thus relieving some pressure on coke supplies.



THE BRONZE PLAQUE (above) was recently presented Clayton R. Burt, president, Pratt & Whitney Division, Niles-Bement-Pond Co., by the 101 employees of the Pratt & Whitney sales organization.

J. & L. to Install Another Electric Clay Gun

Pittsburgh

• • • **Jones & Laughlin Steel Corp.**, at its Pittsburgh works, is to install its second Bailey electric plunger-type clay gun, the first one having been put into operation recently. This second unit will be installed on No. 2 blast furnace when the latter is blown out some time in the future for relining.

DOMINION'S PURCHASES RANGE TO AIR RAID RATTLES OF WOOD

Thunder Flashes, Lifebelts, Anchors, Included In Canada's Orders

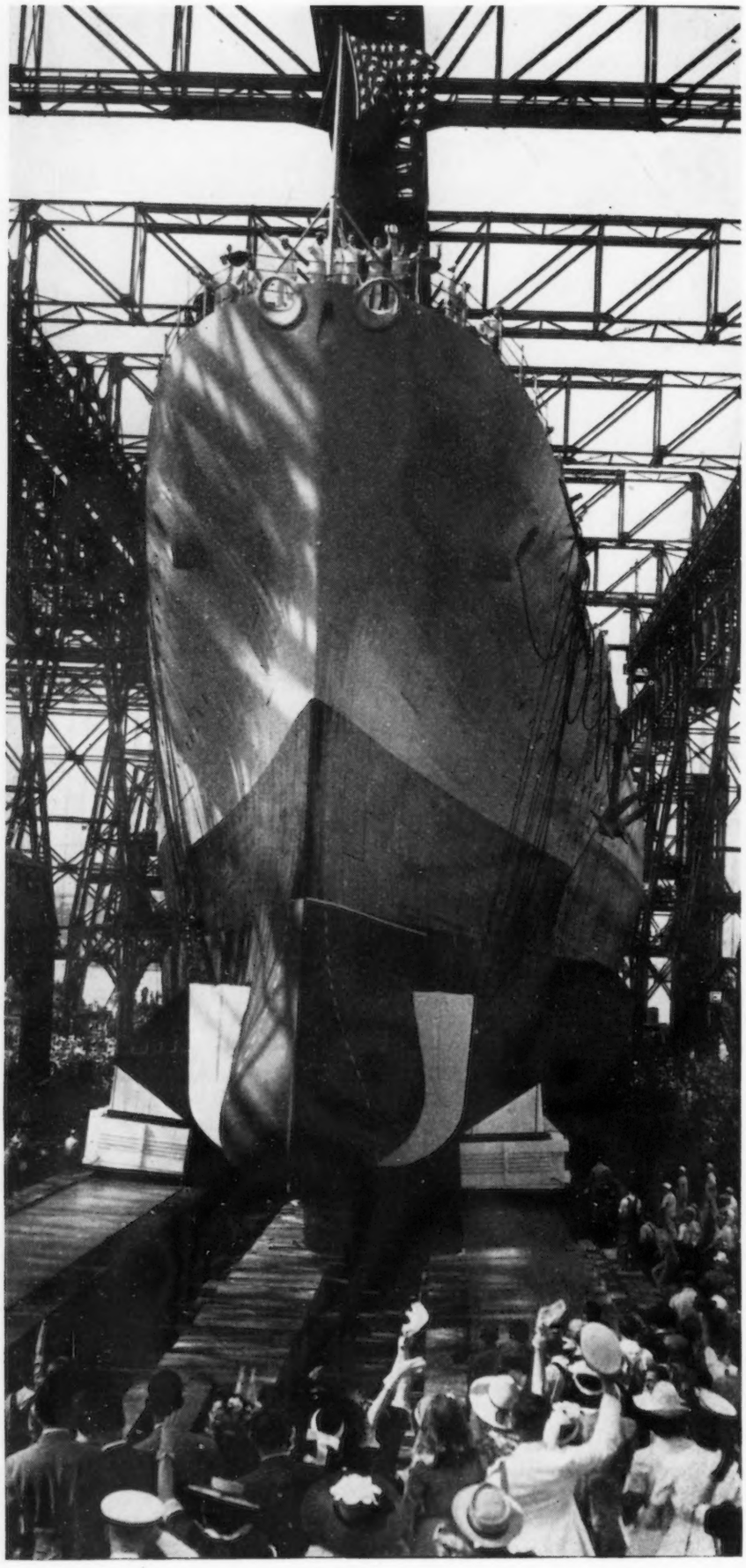
• • • **Goods ranging from wooden** rattles to sphygmomanometers, and from headache tablets to thunder flashes, are included in the purchases by the Department of Munitions and Supply of Canada. These orders indicate something of the extent and the variety of purchases required to meet the war needs of the Dominion.

Recent orders include such things as 4000 gasoline driven, electric generating plants, 5275 camouflage nets, 1000 miles of electric cable, and 432 wireless sets.

It is planned to place orders shortly for 4000 inflatable lifebelts and for 450 anchors. Work has already begun on contracts involving the production of 7000 ground flares, 14,000 thunder flashes, 5000 cordite drums, and over 1,100,000 gallons of aviation gasoline.

While the lumber purchasing section of the department recently purchased close to 5,200,000 ft. of lumber together with a corresponding volume of mill work, doors, sashes, and roofing, it also has on order 870 wooden rattles. These are not of the night club variety, but are the large—and noisy—rattles used in field service for gas attack alarms.

Within the last month 5,000,000 tablets of acetylsalicylic acid have been purchased. These are the omnipresent pick-me-ups similar to those called aspirin by the incognescenti.



2 Battleships Of 45,000 Tons Are Allocated By U.S.

Washington

• • • **Acting within** a few hours after Presidential approval was given the $1,492,000,000 naval appropriation bill, the Navy Department last week awarded contracts totaling $64,324,000 for construction of nine ships and allocated the construction of 13 others to government Navy Yards. Total steel requirements were estimated at 38,000 tons of plain steel and 33,000 tons of armor plate.

Companies given ship awards included the following:

New York Shipbuilding Corp., two light cruisers, $17,580,000 each; Bath Iron Works, two destroyers, $4,898,000 each; Federal Shipbuilding Corp., two destroyers, $5,277,000 each; Electric Boat Co., three submarines, $2,938,000 each.

Allocations were made to Navy Yards as follows:

One Battleship, No. 63, New York Navy Yard, 45,000 tons displacement; one battleship, No. 64, Philadelphia Navy Yard, 45,000 tons displacement; two destroyers, Boston Navy Yard, 1,700; two destroyers, Charleston Navy Yard, 1,700; three submarines, Portsmouth Navy Yard, 1,500; one submarine tender, Mare Island Navy Yard, 9,000; two seaplane tenders, (SM), Boston Navy Yard, 3,200; one mine sweeper, Norfolk Navy Yard, 650.

Contrary to the usual procedure Navy officials, in anticipation of the law, previously had been in communication with shipbuilding companies and obtained tentative bids.

NEWEST OF THE world's battleships and a long step forward in the nation's plan to meet and destroy any possible invader far from our shores is the *North Carolina*, pictured here during the 35,000-ton, $80,000,000 vessel's launching June 13 at the Brooklyn Navy Yard. A sister ship, the *Washington*, was christened June 1 at Philadelphia. Others will follow.

Need for Defense May Weld Ties With Canada Still More Tightly

° ° °

By C. E. WRIGHT
Managing Editor, The Iron Age

° ° °

• • • **Trade between the United States** and Canada has been greatly stimulated by the war. The possibilities for the future are tremendous provided the critical situation abroad does not mean an early end of the conflict. In an article published after a visit to Canada last November this writer said:

> "While the principal occupation of Canadians is the short-range view—the duration of the war—there is also a widespread belief that Canada's long-range development may be accelerated by the war provided its fiscal policies for the conduct of the war are wisely carried out so that the aftermath does not create new and more serious problems. There has been talk to the effect that Canada may become the 'arsenal' of the British Empire. This is a development that only the future course of the war will determine, but it is recognized in Canada that the British Isles are a potential battleground, and, if they should prove to be vulnerable to airplane attack to the extent that industries vital to the successful conduct of the war are seriously affected, then Canada might well become the mainstay of the British Empire in the manufacture of implements of war not only during the duration of the war but afterward. This is a contingency that exists as yet only in imagination; nevertheless it is being given consideration by Canadian officials even to the extent that some vital British plants might be relocated in the Dominion."

That Canada might, if worst came to worst, become the bulwark of the British Empire was a thought entertained in the Dominion many months before the war entered its now serious phase. But not until Winston Churchill's famous declaration of a few weeks ago that Britain would go on to the end even if that meant reliance on the New World did the rank and file of Canadians seriously realize that Canada might become the seat of the British Empire. Even today, however, there is greater optimism among Canadians than among Americans that this extremity will not be reached.

A Canadian newspaper man, John MacCormac, who represented The New York *Times* at Ottawa for many years has just written a book, "*Canada, America's Problem,*" which takes a realistic view of the situation that may confront the Dominion and the United States jointly. "If Canada is attacked," says Mr. MacCormac, "the United States must choose between a war to assist Canada or abandoning the Monroe Doctrine." In its review of this book, The New York *Times* says:

> "With simplicity and force, Mr. MacCormac shows how Canada may become America's problem to an extent that never seemed possible until this year. If Germany defeats Britain, the United States will never permit the Nazis to lay claim to Canada whatever may happen to the rest of the Empire. But suppose that before the final defeat, the King, royal family and Cabinet take refuge in Canada and from that base organize the future liberation of Britain. Or suppose that Britain wins the war after a long struggle but decides that henceforth her military sinews will be based on Canada rather than the British Isles. In either case Canada becomes the nerve center of British power. This is only another way of saying that, in the future, war comes to the Western Hemisphere at the outset. For an enemy doesn't waste time with the periphery but strikes at the nerve center. Here, then, is a problem, both Canadian and North American, that we in the United States have hardly considered."

Times Wide World

COL. JAMES LAYTON RALSTON, now Canadian Finance Minister, will succeed the late Norman Rogers as Minister of Defense for the Dominion.

If Britain is seriously harassed by German attack, it obviously remains that increasing reliance for implements of war will have to be placed on Canada and the United States. As Canada's war program broadens the Dominion will have to call upon the United States for increasing quantities of steel, iron, machine tools and other products necessary to munitions manufacture.

In this connection Canada has a fiscal problem which is being watched closely as is evidenced by the increasingly strict regulation

of foreign exchange. Canada's economy is largely based on a normal excess of exports over imports. Thus far its position in this respect has been maintained, but the excess of exports is shrinking. For example, in the first quarter of 1939 the excess of exports over imports was $56,631,799, but in the first quarter of this year the excess had dropped to $27,753,454.

There is now an unfavorable balance of trade between Britain and Canada, which is being settled as occasion requires by the repatriation of Canadian securities held in Britain. Britain's obligations to Canada are likely to increase, not only in payment for implements of war, but for food products. It is probable that a large part of Canada's 1940 grain crop will be exported to Britain.

In order to obtain the greatest possible amount of American exchange Canada has not let down her efforts to attract as many American tourists as possible this summer. American visitors have left as much as $275,000,000 in Canada in one year. No effort will be spared to persuade Americans that, though Canada is a nation at war, holiday making in the Dominion will lose none of its attractiveness. While Canada may refuse entrance to European aliens, the hospitality that has always been extended to American citizens will not be lacking.

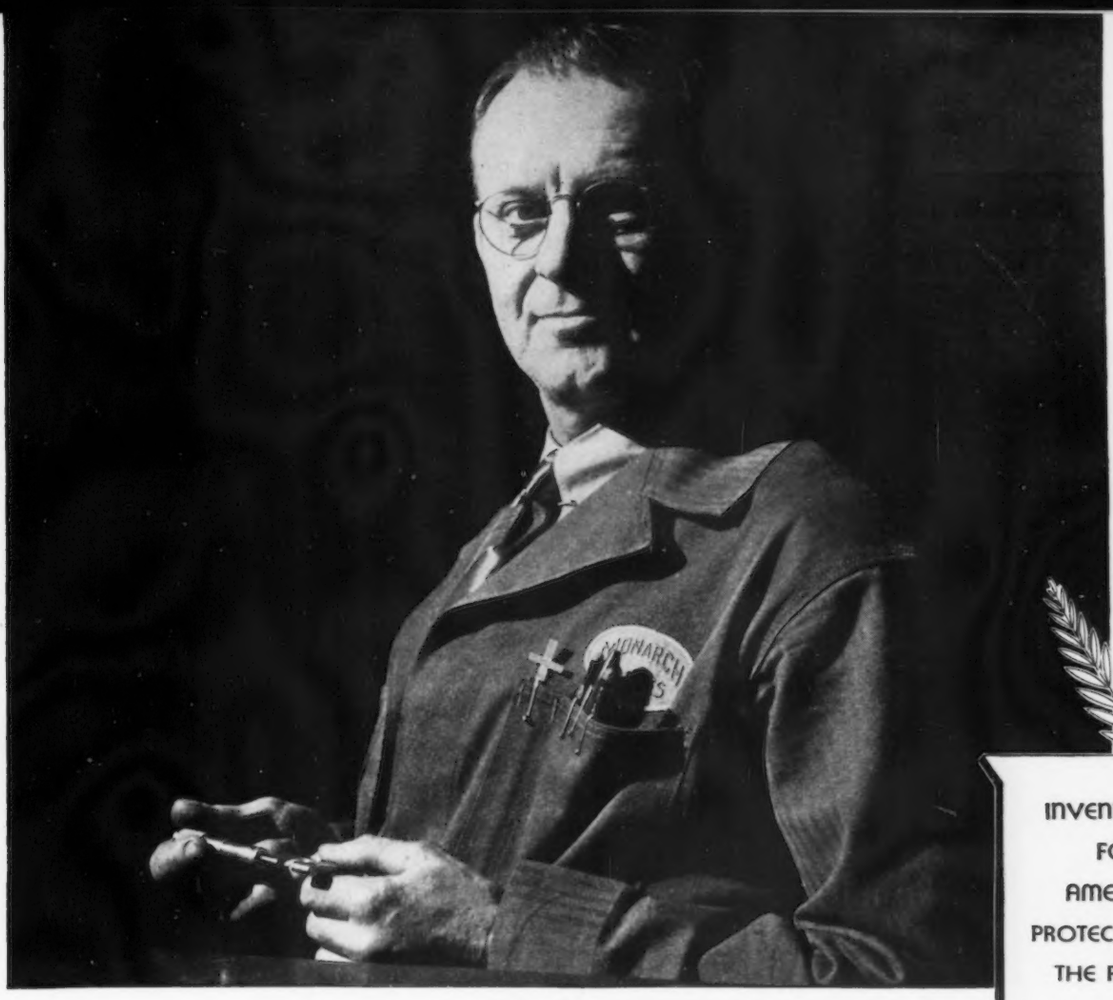
The extent to which Canada has been obliged to increase her foreign purchases for prosecution of war work is indicated by the official figures of the Dominion Bureau of Statistics, which show that total imports for consumption in the first three months of 1940 were $218,879,594 against $142,503,762 in the first quarter of 1939, an increase of about 55 per cent. Canada's imports from the United States have grown from $94,150,087 in the first quarter of 1939 to $151,371,290 in the first quarter of this year. "Iron and its products" constitutes the largest single grouping of Canadian imports from the United States. These amounted to $50,148,310, or nearly one-third of all imports for consumption, in the first quarter of 1940 against $29,509,348 in the corresponding period in 1939. It will be noted that iron and its products made up approximately the same proportion of total imports in the first quarter of both years.

Contrasting with the gain in imports from the United States, and particularly of iron and its products the imports from the United Kingdom into Canada have grown only moderately. Total imports for consumption from the United Kingdom during the first quarter of this year were valued at $30,993,573.

Imports of iron and its products from the United Kingdom in the first quarter of this year were $3,903,348 (against $50,148,310 from the United States) as compared with a value of $3,668,601 in the first quarter of last year. Thus of Canada's total iron and steel imports, 86.6 per cent were from the United States in the first quarter of last year and 90 per cent in the first quarter of this year, while imports of these products from United Kingdom dropped to 7 per cent of the total in the first quarter of this year from 10.8 per cent in the first quarter of last year. These percentages are based on dollar volume, not on tonnage. Moreover, Canada's exports of iron and its products to United Kingdom have been in excess of imports. Exports were $5,377,219 in this year's first quarter against $4,263,988 in last year's corresponding period.

The upward trend of Canadian trade with the United States is borne out by the April figures, released last week. Total imports in April rose to $85,980,000 from $76,733,896 in March, with imports from the United States comprising $58,537,000 in April compared with $52,766,580 in March. Imports of iron and its products totaled $24,349,000 in April against $20,004,523 in March.

Canada's budget for the fiscal year (April 1, 1940, to March 31, 1941) is estimated at $700,000,000, which is about one-seventh of the Dominion's total national income prior to the war. Canada is still committed to a pay-as-you-go policy in paying the cost of the war. Taxation will be greatly increased, but the Royal Bank of Canada points out that even higher taxa-



INVENTIVE GENIUS . . .
FOSTERED BY
AMERICAN PATENT
PROTECTION...ADVANCES
THE PUBLIC INTEREST

MODERN PIONEER...

THERE is no "royal road" to invention. A machinist watching his lathe suddenly envisions a simple improvement that changes the entire pattern of an industry's production. He puts his idea into shape on paper . . . perfects . . . patents it. To this modern pioneer go the rewards of creative genius. To his fellow citizens go the benefits of new jobs and better living conditions . . . because industry can produce more goods for more people, at a far lower cost.

A typical American story with a "believe-it-or-not" ending . . . made possible by the protection of the U. S. Patent System. This is the American way . . . protection, in the public interest, that enables the inventor to write off the cost of development and reap the benefits of his invention.

for Example

One of Monarch's newly developed machines will produce, in money-saving quantity, such precision parts as the airplane valve illustrated here, machining them to intricate shapes from a thin metal template as a routine operation. Only the protection offered by the U. S. Patent System would justify the long-range planning . . . the costly development . . . the endless research involved in Monarch's record of pioneering that has produced so many modern lathe improvements. The Monarch Machine Tool Co., Sidney, Ohio.

MONARCH LATHES

May Finished Steel Shipments By U.S. Steel 1,084,057 Net Tons

Month	1936 Shipments	1936 Per Cent of Capacity*	1937 Shipments	1937 Per Cent of Capacity*	1938 Shipments	1938 Per Cent of Capacity*	1939 Shipments	1939 Per Cent of Capacity*	1940 Shipments	1940 Per Cent of Capacity*
January	795,214	44.8	1,268,403	75.4	570,264	33.7	870,866	51.8	1,145,592	69.8
February	747,375	45.3	1,252,845	82.5	522,395	35.5	747,427	49.3	1,009,256	65.8
March	863,946	50.5	1,563,113	92.7	627,047	37.2	845,108	50.4	931,905	56.8
April	1,080,667	63.2	1,485,231	91.0	550,551	33.7	771,752	47.5	907,904	57.1
May	1,087,395	63.4	1,443,477	85.5	509,811	30.2	795,689	47.4	1,084,057	66.0
June	978,030	57.1	1,405,078	85.8	524,994	32.1	607,562	49.7		
July	1,050,085	61.3	1,315,353	77.9	484,611	28.8	745,364	44.5		
August	1,019,882	59.6	1,225,907	72.6	615,521	36.3	885,636	52.7		
September	1,060,708	62.0	1,161,113	71.1	635,645	37.5	1,086,683	66.9		
October	1,108,973	62.6	875,972	52.0	730,312	43.1	1,345,855	79.9		
November	974,292	59.2	648,727	39.7	749,328	45.6	1,406,205	86.1		
December	1,178,598	68.8	539,553	32.1	765,868	45.2	1,443,969	85.8		
Yearly adjustment..	(—)40,163	...	(—)87,106	...	(+)29,159	...	(—)44,865	...		
Total for year...	11,905,002	58.2	14,097,666	70.4	7,315,506	36.7	11,707,251	59.4		

*Rolled and finished steel capacity.

The above table has been revised to conform with the practice of reporting shipments on a net ton basis inaugurated by the corporation in January, 1940. Previously, monthly shipments were reported as "tons," which included both net and gross tons on an unadjusted basis.

tion will be "quite inadequate to meet the cost of the war effort necessary in the present emergency and Government revenues must be supplemented by borrowings; in the long run by heavy borrowings. Under existing circumstances these amounts must be raised by our own people and not borrowed elsewhere as in the last war."

Canadians are asked to sacrifice current expenditures for non-essential goods. Graham Towers, governor of the Bank of Canada and a member of the Advisory Committee on Economic Policy, recently said that Canadians "must think twice before they make purchases which are not essential. Increased incomes must not, in general, be spent for private purposes if we are to avoid serious trouble. They must be returned to the State in the form of taxation or subscriptions to war loans.

Although Canada has officially been at war for more than nine months many peace-time problems remain, chief of which is unemployment, which is ranged alongside the fact that a shortage of skilled workers is already being experienced and will be increasingly felt as war work expands. Eventually unemployment will disappear, it is believed, but meanwhile people who are asked to refrain from purchases of non-essential consumer goods in order to conserve capital for war purposes are complaining that the transition to war work has not yet proceeded rapidly enough to support the mass of the people if non-war purchases are immediately curtailed.

But Canada is determined to extend its war work rapidly both on its own account and for the Allied governments. A message sent by Premier Mackenzie King to the Canadian High Commissioner in London conveyed the statement that "the Government continues

to be of the opinion that Canadian plants might be utilized to a far greater extent as a source of supply to the Allied governments" and pointed out that these plants are advantageously situated and "relatively free from danger of hostile action." Canadian manufacturers stand ready and waiting to help the Allies arm.

Up to now the Canadian program has been based on the probability that Canadian military forces would be working with British forces and that their equipment should follow identical lines. The misfortunes of war, however, have raised another question: Canada and the United States are now faced by the need for joint defense. This, in fact, is the heading on a discussion of the subject in *The Financial Post* of Toronto (June 15). *The Financial Post* says that "sweeping changes in Canada's defense problem have been produced by the rushing torrent of events." It cites three reasons given by Canadian military observers for a change in Canada's program:

1. The sweep of American public opinion which, if it continues its present pace, will probably bring formal entry into the war unless the European situation takes an extraordinary turn for the better.

2. The now partial breakdown of British military supply lines to Canada.

3. The possibility — fantastic though it may appear —of armed invasion of this continent.

"The feeling is fast growing among military men in Canada," says the article, "that Canada must take the initiative in taking up her second defense line problem with the United States."

Knowlson Elected by Radio Manufacturers

• • • **James S. Knowlson,** president and chairman of Stewart Warner Corp., Chicago, was elected president of the Radio Manufacturers Association last week, at a meeting in Chicago. A graduate of Cornell University, he became an electrical engineer for General Electric Co. at Schenectady, and prior to joining Stewart-Warner was president of the Speedway Mfg. Co., Cicero, Ill.

Harvester Warns Against Coercion of Employees

• • • **Serious stoppages of** work in order that union men could coerce non-members into joining the organization were cited last week by the International Harvester Co. as sufficient cause for dismissal of some of the union workers in its Chicago tractor works. The union agreed in its contract not to intimidate or coerce employees into membership, according to the company, and also agreed not to make use of the sit-down or slow-down strike for cause. The company has, therefore, written a letter to all employees of the tractor works warning them that those using coercive methods such as are prohibited in the contract may give the company grounds for their dismissal.

Scrap Consumption In U. S. Advances 22%

• • • **Domestic consumption of** iron and steel scrap jumped 22 per cent in May to 3,353,000 gross tons for the month, it is estimated by the Institute of Scrap Iron and Steel Inc. This is the largest use of scrap for any month since January, and compares with 2,753,000 tons in April, and 2,263,000 tons in May, 1939.

In the first five months of 1940, domestic scrap use is estimated by the institute at 15,867,000 tons, compared with 12,022,000 tons in the corresponding period of 1939. Domestic consumption of scrap is now running 16 times as large as exports which, for April, the latest month for which Government statistics are available, totaled only 221,152 tons. Exports thus far in 1940 have been averaging only 212,563 tons, against 298,119 tons per month in 1939.

G-M Plane Propeller Plant to Employ 1500

Dayton

• • • **The new $5,000,000** airplane propeller manufacturing establishment arising from General Motors Corp. purchase of the assets, patents, etc., of Engineering Projects, Inc., will locate its plant on a tract adjacent to the municipal airport at Vandalia, on which options have already been taken. W. J. Blanchard, president, Engineering Projects, Inc., will head the new division as general manager, while E. J. MacNeil will have charge of engineering and research. The company, which will be one of the three largest aircraft propeller manufacturers in the nation, will employ upward of 1500 workers.

Western Engineers Offer Full Aid to Government

Chicago

• • • **The Western Society** of Engineers has offered its full cooperation to the President and various departments of the Government in personnel and technical problems arising in the problems arising in the program for military and naval defense, through a letter written by L. R. Mapes, president of the society.

Koppers Builds Chemical Plant at Everett, Mass.

• • • **First commercial** plant in the United States for production of ammonium thiocyanate crystals, valuable industrial and agricultural chemical, is soon to begin operation, according to Koppers Co., Engineering and Construction division, which has just started construction of the plant for the Eastern Gas & Fuel Associates at Everett, Mass. The plant will be able to produce 1800 tons of ammonium thiocyanate a year in various grades. At present supplies required by industry and agriculture have to be imported. The chemical is used by the metallurgical industries in the coating of zinc.

SKF Awards Contract For Plant Alterations

• • • **General contract for** alterations to the former Watson Stabilator Co. plant, covering a five-acre tract in the Bridesburg section of Philadelphia, has been awarded to the Turner Construction Co. by R. F. Runge, vice-president of SKF Industries Inc.

This plant was recently acquired by SKF Industries to provide immediate facilities to expand their production in order to take care of customers in this part of the world, many of whom were served by their plant in Sweden. Work is being started immediately and includes substantial exterior and interior alterations.

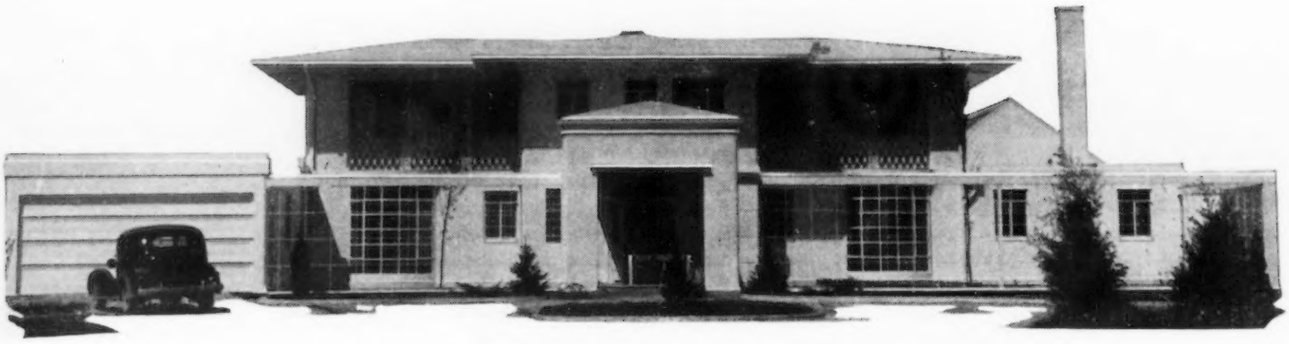
Hecht, Steel Recovery Inventor, Can Stay in U. S.

Cleveland

• • • **President Roosevelt** has signed a bill which permits Erich Hecht, head of the Holland Engineering Co., with offices in Republic Building here, to remain in the United States and eventually to become a citizen. German born, but a citizen of the Netherlands, Mr. Hecht came to this country last year. His passport visa had expired and normally he would be required to return to his native land and await admission to the United States under immigration quota of his country. He is the inventor of a process to recover steel from waste slag.

Trade Training Facilitated By New 16-mm. Sound Films

• • • **Sound motion pictures** providing simple and practical instruction in all phases of mechanical trades, such as tool and die making, precision measuring and layout methods, machine tool set-up and operation, and related subjects, are to be released on July 1 by the Film Productions Co., 1504 Hennepin Avenue, Minneapolis. More than a year of research and planning went into the preparation of these 16-mm. films. Full use is made of animated drawings, macrophotography, slow motion and many other advantages of motion pictures. They are expected to prove valuable in the training of skilled workers needed to complete the new national defense program.



NOT A NAIL or stick of wood was used in this arc welded steel, 10-room house just completed at Troy, Ohio, for E. A. Hobart, president, Hobart Welders, Inc.

Welding Rod Output Is Quadrupled at Trafford

Pittsburgh

• • • **Within the next few** weeks, Westinghouse Electric & Mfg. Co., at its Trafford, Pa., plant, will begin producing coated rods for electric welding at the rate of more than 400 a minute. The company's new plant which embodies facilities of the latest type for quality control and rapid production of welding rods, will have a capacity about four times as great as the previous output level.

Production is on a straight line flow basis with complete automatic control of drying and baking operations. The baking ovens consist of five sections, each of which is automatically controlled for temperature, speed, and humidity, thus insuring a uniformity of product.

The equipment is located on one floor, and a feature of the flux department is a Johns rubber conveyor which takes the fluxing material to a higher level where it is emptied into the dry mixing equipment.

Plant officials say that a conservative estimate indicates that the normal growth in the use of welding rods will about double the present rate within the next ten years. Other sources believe that not counting the probable effects of the domestic armament program, increased use of welding methods will bring about the 100 per cent increase in welding rod consumption within the next five years.

Burks Pump Sales Are Up 35% So Far in 1940

• • • **Sales and shipments** of Burks pumps, water systems and condensation return units increased 35 per cent in the first four months of 1940 over the corresponding period of 1939, the Decatur Pump Co., Decatur, Ill., reports. B. G. Duer, general sales manager of the Decatur company, has announced to the trade a new series of Educer deep well systems after ten years of testing and engineering in the field.

Air Line Sells Planes For Use in Canada

Pittsburgh

• • • **Pennsylvania Central** Airlines have sold to a New York banker four twin-motor Boeing transport planes for ultimate transfer to Canada, it was learned here last week. The Boeings, now replaced on the PCA routes by new Douglas superliners, probably will be used for training of Canadian air fighters and for troop transportation, it is said.

OUNCES MUST DO THE WORK OF POUNDS IN AIRCRAFT SO . . . a cyclone was put to work!

IN THE AIRCRAFT INDUSTRY every ounce of metal does a man's size job . . . and in the lightning pace of the industry those ounces are continually becoming fewer and fewer so that man may travel faster and faster. Metallurgically then, there can be no dead weight due to low physicals . . . each ounce must be a giant in strength . . . and do the work of a good many old-fashioned ounces. Practically every important aircraft and aircraft accessory builder in the country has found the Cyclone indispensable in standardizing and maintaining maximum physicals in the heat treatment of aluminum and the ferrous alloys.

In heat treating formed aluminum, for instance, every part, and every part of every part must be heated to precisely the same temperature to secure maximum strength on quenching. Likewise, when a 20-lb. forging is carved down to a 4-lb. finished landing gear part—every ounce of those 64 ounces must be equal in strength to every other ounce. Aircraft makers put the powerful Cyclone blast to work and got the kind of heat treatment which has enabled those pounds to be cut to ounces.

No greater tribute can be paid to any equipment than that in the aircraft industry where quality is the *first* consideration, Cyclone Furnaces are *first* choice . . . for here, as in the whole metal field . . . twice as many Cyclones are being sold as are all other air tempering furnaces combined.

50,000 Planes . . . Boom production at the Lindberg Plant is nothing new . . . because the demand for Cyclones and Hydryzers has necessitated production lines for the past three years. With this tremendous furnace production has come a knowledge and experience unequalled and unsurpassed in the heat treating industry. With it comes the pledge that Lindberg Products give you the best heat treating that any money can buy. Likewise, because a production boom at the Lindberg Plant is the rule rather than the exception, great demand is no stimulus for artificial price raising. You can be sure of fair prices . . . deliveries as promised . . . and competent service . . . boom time or super-boom time.

LINDBERG ENGINEERING COMPANY

228 NORTH LAFLIN STREET CHICAGO

Defense Research Committee Set Up; Stettinius' Staff Enlarged

Washington

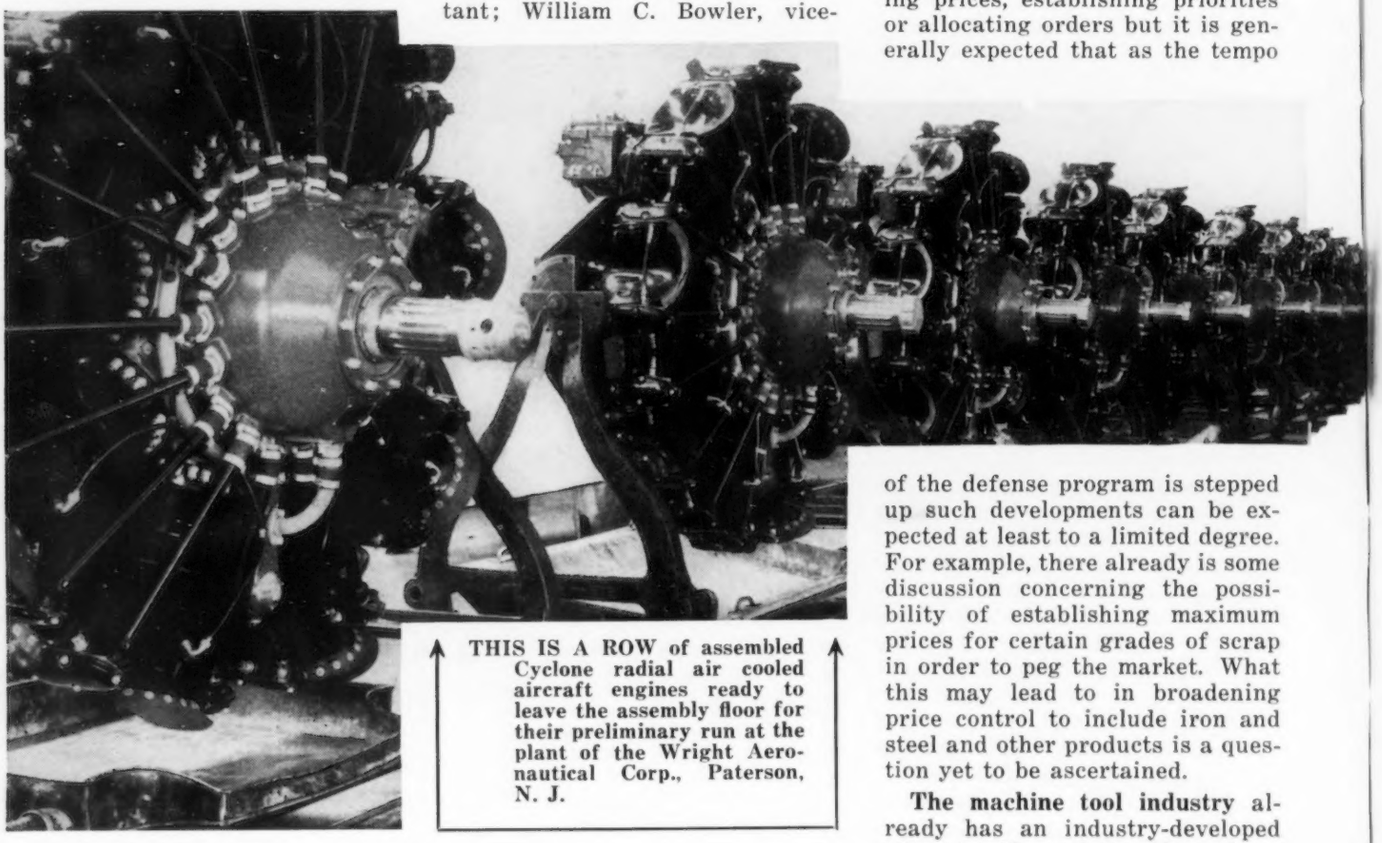
• • • **Edward R. Stettinius, Jr.,** member of the National Defense Advisory Commission in charge of raw materials, last week named additional industry representatives to his staff, including a consultant on the steel industry, Walter S. Tower, president of the American Iron and Steel Institute and adviser to the United States Shipping Board during the World War.

At the same time President Roosevelt announced the creation of a National Defense Research Committee whose job will be to mobilize industry, government and scientific laboratories in an effort to accelerate the defense program. The new committee, headed by Dr. Vannevar Bush, president of the Carnegie Institution, will function under the National Defense Advisory Commission.

Other members added to Mr. Stettinius' staff included W. Averell Harriman, chairman of the board, Union Pacific Railroad, and former chairman of the Commerce Department's Business Advisory Council, to act as liaison between Mr. Stettinius and Ralph Budd, member of the Commission in charge of transportation.

Also M. B. Folsom, treasurer, Eastman-Kodak Co., senior assistant; William C. Bowler, vice-president, New York Central Railroad, to be placed in charge of problems involving raw material procurement; Blackwell Smith, member of the New York law firm of Wright, Gordon, Zachry & Paril, and former assistant general counsel of the NRA, to be a legal adviser to Mr. Stettinius; and Edward R. Weidlein, director of the Mellon Institute, Pittsburgh, consultant on chemistry.

Mr. Stettinius and his advisers also made plans to move from the privately-owned Federal Reserve Board building across Constitution Avenue to the Munitions building housing the War Department.



THIS IS A ROW of assembled Cyclone radial air cooled aircraft engines ready to leave the assembly floor for their preliminary run at the plant of the Wright Aeronautical Corp., Paterson, N. J.

Armor plate production is now openly referred to as a bottleneck by members of the advisory commission. In this connection two related problems under study by War Department officials are understood to pertain to tank armor as well as axles. Also being discussed inside the commission is the possibility of a subsequent production burden on the machine tool industry which may ultimately be cause for some concern.

It has been emphasized that there are no present plans for fixing prices, establishing priorities or allocating orders but it is generally expected that as the tempo of the defense program is stepped up such developments can be expected at least to a limited degree. For example, there already is some discussion concerning the possibility of establishing maximum prices for certain grades of scrap in order to peg the market. What this may lead to in broadening price control to include iron and steel and other products is a question yet to be ascertained.

The machine tool industry already has an industry-developed plan of self-regulation through an 8-member coordinating committee headed by William S. Knudsen, member of the advisory commission in charge of production. The government also is represented on the machine tool committee by two representatives each of the Army and Navy. It may be expected that there will be more specific plans unfolded on these subjects when the centralized purchasing committee under the direction of Mr. Stettinius reports on a study now under way.

Leon Henderson, member of the advisory commission in charge of prices, is understood to have called in Robert R. Nathan, chief of the

division of national income statistics for the Commerce Department, to conduct a survey of the country's manufacturing facilities.

The newly-created National Defense Research Committee will be composed of eight scientific authorities with an Army and Navy officer attached as technical advisers. All research work in connection with the defense program whether conducted by industry or educational institutions, except in the aeronautics field, will come under the general supervision of the committee. The National Advisory Committee for Aeronautics, which has asked the Society of Automotive Engineers to study the question of reducing the number of special steels in a move aimed at greater standardization in aircraft design and production (see THE IRON AGE for June 13, p. 56), will continue to have jurisdiction over aviation research but will participate closely with the new research committee.

Also working with the committee will be the Bureau of Standards, the National Research Council and the National Academy of Sciences. All research functions will be coordinated with the National Defense Advisory Commission.

In addition to Dr. Bush, members named to the research committee included Dr. J. B. Conant, president, Harvard University, Richard C. Tolman, California Institute of Technology, Karl Compton, president, Massachusetts Institute of Technology, Conway P. Coe, commissioner of patents, United States Patent Office, Dr. Lyman J. Briggs, director, National Bureau of Standards, Dr. F. B. Jewett, president, National Academy of Sciences, Secretary of War Harry H. Woodring, and Secretary of Navy Charles Edison.

The advisory commission's role in restricting exports of essential materials under the House and Senate-approved embargo provision of the May-Sheppard bill was referred to briefly by President Roosevelt last week at a news conference after the Chief Executive was asked about reports that an embargo may be placed on scrap exports except to France and Great Britain.

Asked by a representative of THE IRON AGE what type of machinery would be set up to administer the embargo authorization, Mr. Roosevelt replied that he plans no special machinery under the measure but that the job will be handled by the raw materials section of the advisory commission under Mr. Stettinius, and by the Commerce Department, presumably the minerals and metals division, with the final steps to be taken by the State Department's Division of Controls.

Mr. Roosevelt said he had received no information on reports that Japan is seeking greater quantities of scrap iron and steel but he implied that such restrictions on exports may not be unlikely in view of the admitted Governmental policy of retaining for ultimate domestic use all commodities considered essential to the defense program.

Although Mr. Roosevelt did not mention the coordinating committee of the machine tool industry, there were indications that the committee would actively participate in the work of the advisory commission in passing on export restrictions under the May-Sheppard measure. Reports have been current in recent weeks that the Government already had taken steps to curb exports of machine tools and other products but these reports have been denied in Washington. In the absence of express contractual authority, the Army and Navy would be given priority for machine tools ordered by foreign purchasers under pending legislation which is generally expected to have no difficulty in being passed by Congress.

Phraseology pertaining to export restrictions in the May-Sheppard bill, as finally approved by both Houses of Congress, follows:

"Section 6. Whenever the President determines that it is necessary in the interest of national defense to prohibit or curtail the exportation of any military equipment or munitions, or component parts thereof, or machinery, tools, or material or supplies necessary for the manufacture, servicing, or operation thereof, he may by proclamation prohibit or curtail such exportation, except under such rules and regulations as he shall prescribe. Any such proclamation shall describe the articles or materials included in the prohibition or curtailment contained therein."

Army Will Buy 1000 Scout Cars

Rock Island, Ill.

• • • Bids were to be opened at the arsenal here June 20 for construction of 1000 scout cars for the Army. Cars of this type now in service were mainly constructed at the Rock Island Arsenal and the June 20 opening will be the largest order ever asked from private manufacturers. The cars now being used are light, fast, four-wheel vehicles for advance guard use.

Army Appropriation Provides 2566 Planes

Washington

• • • **The $1,822,522,958 Army** appropriation bill, an important part of the $5,000,000,000 defense program, was approved by the White House last Friday. Briefly, it provides for:

1. The purchase of 2566 new planes by the Army Air Corps, of which 2200 will be training aircraft, and 366 combat planes, including 200 large bombers.

2. Total appropriations of $345,000,000 for critical items including tanks, anti-aircraft guns, more Garand semi-automatic rifles, anti-tank guns, armored cars and related equipment.

3. Approximately $35,000,000 for industrial mobilization purposes, of which $16,250,000 will go for educational orders; and about $31,000,000 for motorized equipment.

4. An emergency blank check fund of $66,000,000 to be placed at the disposal of President Roosevelt with which he can finance the expansion of machine tool, aircraft, munitions and other plants needed under the defense program.

Ford Ready for Mass Production Of Equipment for U. S. Defense

By FRANK J. OLIVER
Associate Editor, The Iron Age

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• • • **Faced suddenly with** the tremendous problem of belatedly arming itself for defense, the country through its national leaders turned instinctively to the automotive industry to apply the typically American system of mass production to the manufacture of mechanical instruments of war—planes, tanks, guns, munitions and battleships—on a scale heretofore never seen in the United States, even in World War days. American industry applauded the selection of William S. Knudsen, president of General Motors and primarily a production man from way back in the early beginnings of the automotive industry, as the man to head the coordination of production for national defense. It is significant, too, that Harold S. Vance, chairman of Studebaker Corp., is to assist Mr. Knudsen as head of the machine tool procurement section of the National Defense Advisory Committee.

But what struck the popular imagination was Henry Ford's quoted statement a few weeks ago that if freed of Government red tape, he could build 1000 airplanes a day. Mr. Knudsen's reply to queries on this score was: "If Mr. Ford says he can do it, he can." Since then Mr. Ford has looked over a Curtiss P-40 pursuit ship and announced that it offers no particular problems for producing in large quantities.

Mr. Ford, still the country's most rugged individualist, was speaking as a strategist—one who plans broad maneuvers on a vast scale. Strategy has been tersely defined in a military sense as the art of concentrating an effective fighting (or working) force at a given place at a given time, and tactics as the art of using such a force when there. Henry Ford has a production formula, now mellowed by the passage of over 40 years, and an organization unique in American industry. This article will attempt to highlight briefly the formula and to give some thumbnail sketches of the tacticians—the men to whom will be assigned the job of tooling up for mass production and then producing those instruments of defense now quite foreign to the Ford line of motor cars, trucks and tractors. It will attempt to lift the veil of anonymity that up until now has cloaked the majors and the captains and even the generals in the Ford organization.

WILLIAM F. PIOCH first became associated with the Ford Motor Co. in 1912 as a tool designer. Due to his unusual abilities, he was advanced to assistant to the chief of mechanical design and later became head of the department, the position he now holds. In his regular job, he is the man responsible for the methods used in the manufacture of Ford cars and the selection of the equipment used in all Ford plants.

The high command of the Ford Motor Co. is surprisingly small for a company of its vast size. The founder at 76 is still very much the supreme commander, makes the big decisions and passes on all major design changes of the products. Although he still likes to hear himself described as an inventor and does contribute much originality to the design of the cars, one of his chief interests is production methods. He delights in doing things "that can't be done" and in reducing production costs below the previously irreducible minimum. Nevertheless when he makes up his mind to lick a tough production problem, such as casting the Ford steel crankshaft, and says in effect, "Damn the torpedoes! Full steam ahead!", it is the men down the line, the tacticians, that must carry the load and bring back the practical solution—not excuses as to why the job cannot be done.

Henry Ford governs by indirection. He states a broad objective and hints at a general solution, then waits for his subordinates to bring back an answer, some answer. More often than not this answer will be expressed in a full or partial scale model. Blueprints don't tell enough. Once Mr. Ford's critical eye has appraised the conception, a nod of approval or disapproval may be his only reaction. He is a man of few words. If the nod says "no," it means another try, shooting at the objective from a different angle.

Edsel Ford's interests as president are primarily sales and finance although it is known that his ideas have dominated recent Ford automobile styling. Under his direction, as well as that of his father, come the divisional commanders such as Charles E. Sorensen, general manager, Peter Martin, vice-president (the only man in the organization bearing that title and the only director of the company outside the Ford family), and A. M. Wibel, director of purchases, a man having control of one of the biggest spending budgets in the country, and B. J. Craig, secretary of the company.

Peter Martin's job is really that of production manager. To use his own words spoken some years ago, he keeps things moving at the Rouge. Soft spoken and mild mannered, he keeps the technical bugs ironed out of production. For a high ranking officer, he carries a great amount of detail, spending practically all of his time out in the shop, making the hour-to-hour decisions necessary for changes in routine to keep things moving. If

the shifting of a pipe plug hole 1/8 in. will simplify and speed up the placing of cores or molding of a cylinder block, Mr. Martin passes on the changes, but only after weighing all the factors involved in minute detail.

Like Mr. Martin, Mr. Sorensen is a production man too, but his job is more that of a line officer than that of a staff man like Mr. Martin. More of a driving type, he works largely through the divisional superintendents, the mechanical design department (production engineering) and the laboratories.

HENRY FORD in a typical contemplated pose as he listened last week to Major Paul Kremmer (left) explain the design and performance features of a Curtiss P-40 pursuit ship. With him is Edsel Ford, president of the Ford Motor Co., and at the right, Charles E. Sorensen, general manager.

All three men have capable assistants to whom they delegate a large part of their duties. John Crawford is prominent as assistant to Edsel Ford.

To the lay mind, mass production is best typified by the assembly line and the assembly line method is naturally associated with the Ford Motor Co. because it was Henry Ford who pioneered the process at the Highland Park plant in 1913-14. In the confines of the metal-working industry, however, when we speak of tooling up for mass production, we refer to those manufacturing techniques that make the assembly line possible, namely the making of interchangeable parts to a high degree of selected precision on a fast production basis. Primarily it is tool engineering that counts, and of course it is the vast quantities of automobiles sold yearly that permit the automotive industry to indulge in such elaborate tooling setups as to produce extremely accurate work in extremely short times with relatively unskilled labor. The skill and precision are built into the machine.

It is this writer's impression that the Ford Motor Co. has one of the largest production engineering departments of any industrial firm in the United States, if not the largest. Because of the predilections of Henry Ford, his interests and his hobbies, it is here that the largest collection of brains in the company can be found outside the master mind of Henry Ford. W. F. Pioch is head of this division, known as the mechanical design department. This department covers a huge U-shaped area on a mezzanine deck of the foundry machine shop building, south of Gate 4 on Miller Road. There are approximately 400 men employed here as tool engineers, tool and die designers, special machinery designers, oven and conveyor men, machine tool trouble shooters and machinery buyers. Mr. Pioch has a group of seven assistants who head up these various mechanical design divisions, three of them on tool and fixture work, although the biggest group in numbers of draftsmen is devoted to die design. Howard C. Kellogg ties this group into the purchasing department as machinery purchaser.

In a program involving aircraft engines, men like Oscar Hovey and Walter F. Wagner, both of the Lincoln Motor Car division, would undoubtedly be called in to help, since both these men were abroad last year studying British and French aircraft engine production methods. Mr. Wagner is better known outside the plant through his activities as national president of the American Society of Tool Engineers, 1938-39.

If Henry Ford is called upon by Mr. Knudsen's committee to produce airplane engines, airplanes, tanks, tractors or Eagle boats as were made in 1917-18 at Highland Park, it will be up to this department to plan the order of operations, design and buy or build the necessary machine tools and other productive machinery before turning the job over to Mr. Sorensen's army to produce.

The Ford Motor Co. has an engineering laboratory several miles west of the plant in old Dearborn, but relatively little activity is carried on there. The polished hardwood floors of this beautiful structure have been used for old-fashioned cotillion dances in past winters. Research engineering on the product is carried on here. In fact, it is here where some of Mr. Ford's brain children are hatched that will emerge eventually as features of the 1943 model or later. L. S. Sheldrick, in charge of chassis engineering, has a position that corresponds to the chief engineer of other automobile companies. He is concerned with next year's engine designs and chassis details.

The real research laboratory of the company is the plant itself,

particularly as regards the continual experimenting being done on production methods. Ford engineers are constantly pioneering new shop methods and have acted as midwives to the birth of many a design innovation in machine tools. The classic example is an automatic multiple spindle vertical lathe, now widely used throughout industry. Ford Motor Co. has taken many a machine tool builder's partially developed design, put it to work in the shop under detailed supervision, worked out the "bugs" and turned the redesigned and workable product back to the builder with an order for six more. Small wonder the machine tool industry likes to do business with the company.

The Ford company was first to persuade a machinery builder to make a vertical spindle, internal grinding machine or a rotary station type drilling machine. From the start Ford has hammered away at the necessity of automatic lubrication of machine tools, first advocated built-in motor drives and later carried the idea to better outward appearance generally. Automatic sizing of work in grinding operations was quickly adopted by this progressive firm and the company lent encouragement to hardened and ground wearing surfaces on machine ways. Single point precision boring of cylinders and bearings early received recognition here. Ford has also devised many special machines, such as completely automatic inspection gaging equipment, and novel methods of making intricate die castings.

Ford engineers have also pioneered in other lines. They have revolutionized foundry practice and today pour hundreds of tons of castings that the average foundry would consider too difficult to mold. The two cylinder banks cast integral with the crankcase of the V-eight engine is one such example. The idea of going from a forged to a cast steel crankshaft was radical enough, but it imposed tremendous problems in the foundry. The job was finally licked by using as a vertical mold a stack of interlocked dry sand molds, resembling hollow baked cores.

The chief metallurgist of the Rouge plant is R. H. McCarroll, but his job encompasses more than the title would imply in the ordinary plant. He is in charge of the technical aspects of all materials entering into the product, used in the plant or processed there—from open-hearth furnace operations to synthetic resins made from soy beans. His large department produced the alloy steel that gives greater fatigue properties to a cast crankshaft than to a forged one, and has developed a series of alloy steels for special product applications. Synthetic enamels of great durability made from soy bean oil were also developed here.

A number of names have been mentioned in the foregoing, but the Ford company would be difficult to show on an organization chart. Titles are few and there is a network of crossing lines. Some division heads report to three or four top executives. This is not to say, however, that there is a lack of coordination. Cohesion of all the important functions of this large manufacturing organization is obtained through the medium of a daily conference following luncheon at the Dearborn laboratories. Regularly at the round table sit the two Fords, Messrs. Sorenson, Martin, Wibel, McCarroll, Sheldrick, Craig, Crawford, H. C. Doss, general sales manager, and W. J. Cameron, well-known radio commentator. Here problems are tossed about for discussion from the many viewpoints represented by each man.

Mr. Ford has said he could turn out products for our defense needs without disturbing his regular automotive production. This is true if the potential enemy gives us the time. Undoubtedly he had in mind using the immense floor space of the old Highland Park plant, now largely idle. In 1909, when this plant was built it was the largest in the world, covering 60 acres, but it is dwarfed by the more than 1000 acres at the present River Rouge site. It must be remembered, of course, that the Rouge plant is now a completely integrated industry, containing as it does blast furnaces with ore docks, a battery of coke ovens with gas containers, power house, cement plant, tire plant, glass plant, open hearths and rolling mill, forge shop, foundry, press shop, and what is probably the largest tool and die shop in the country, aside from acres of machine shops, cylinder block lines and assembly divisions used in the final fabrication of the car. For many years the Highland Park plant was leased to the Briggs Mfg. Co. for the fabrication of a part of Ford's body requirements, but most of the work was pulled into the Rouge plant last year upon completion of the new press shop.

During the last World War, the Ford Motor Co. produced Liberty engines for aircraft, like many another automobile manufacturer. By the time the armistice was declared, production was being stepped up rapidly, but in the earlier months of the program production lagged considerably behind schedule largely because of the terrific amount of engineering changes that were put through from week to week. At one time Henry Ford was quoted as saying: "Rushing into manufacturing without being certain of the product is the unrecognized cause of many business failures." That is why today he qualifies his estimates of large aircraft production with a big IF—if he is free of Government red tape and is allowed to do things his own way.

If he is given considerable latitude, we may expect to see production of aircraft engines ultimately revolutionized, although at the start in order to get into production fast conventional methods will be followed very likely. No one close to the scene expects to see the Ford company tool up for 1000 planes a day and many more engines right off the bat. A much more conservative figure would be 40-50 per day at the start. Yet no one doubts that the organization described above, which at one time turned out 9600 model A cars a day and is currently capable of producing 6000 cars daily containing many more parts, could readily reach the 1000 plane a day objective without straining itself. In fact, the advisability of producing 1000 airplanes a day is limited only by the Army's and Navy's ability to train pilots. The bottleneck is not in industry. But whatever the Ford Motor Co. is called upon to do, one can be sure that the results produced will be followed with keen interest throughout the world.

Stout's New Plane, Radical In Design, Emphasizes Use Of Steel

By W. F. Sherman

Detroit Editor

o o o

• • • **Nearly twenty-five years ago** William B. Stout, a fledgling aeronaut, built for the Navy in war time its first bat-wing type aircraft and also its first all-metal airplane. Aviation history tells the rest of the story—the final adoption of the thick wing type of monoplane on practically all of the military and commercial airplanes in the world today and the trend to all-metal construction, initiated commercially by the Ford tri-motor plane which Stout designed in 1925.

That tri-motor, all-metal airplane which Henry Ford eventually produced in quantities as great as 10 a week was another historic step in aviation and one for which principal engineering credit must go to Stout.

The tricycle landing gear, a 3-wheeled type in which the essentials are a pair of landing wheels behind the center of gravity of the aircraft and one wheel in the nose ahead of the center of gravity to prevent overturning, was designed in 1931 and the idea was copied extensively in 1937 or thereabouts and was adopted by several aircraft producers. It is now the type of landing gear used in the latest military and commercial airplanes, and is standard on some of the new planes which are not yet in production.

The same plane in which the tricycle landing gear first appeared, the Stout Skycar, provided also the initial appearance of his version of the pusher type airplane (the propeller in the rear). An approximation of this idea is incorporated in one of the latest military airplanes.

Stout, who amazes his colleagues and contemporaries with his versatility and his genius for being ahead of the game, even to the point where he appears to be a radical among designers, has had a colorful career as artist, newspaper man and engineer.

He appears now to have in his grasp the basic ideas which will make mass production of airplanes feasible and economical. Despite all the work done by others on the use of welded stainless steel, he appears to have the immediate and perhaps the lasting solution to the problem of fabricating stainless steel aircraft.

As revealed last week in THE IRON AGE (pp. 54 and 83) the Stout Engineering Laboratories, Inc., at Dearborn, Mich., is completing plans for a plane to be built by the Stout Skycraft Corp. This work has already excited much comment from experts who have experience from which to appreciate Stout's recent development. It has even been predicted that Stout-developed methods will predominate if and when mass production of wings and fuselages is realized.

In his design there is no dazzling "honeycomb" of metal trusses, ribs and diagonals such as complicate the manufacturing problems for other airplane designs. Also, study of his proposed fabricating methods indicates that he has found a way to do the job without elaborate dies, without cold-working the difficult material, without rivets, without putting such serious working stresses in the material as to require extreme inspection methods.

In a design which is now being built for the Army as a training plane, Stout has started making use of metal in an aircraft to the 'nth degree. Stresses which aircraft skin covering has never been called upon to bear are imposed on the structure and metal covering which he has designed. Tests have indicated reliability under repeated high loads, without wrinkling the smooth (not corrugated) covering.

An outstanding feature of his fabricating methods is in the shaping of stainless steel. The material, of course, cold works quickly and will not withstand a great deal of cold working. Typical sections desired for aircraft frameworks are difficult to form because of this deficiency in the material. For instance, flanged channels used in wing structures and for fuselage frames must be curved to accommodate the streamlined exterior contours. When put through forming rolls, such channels cold work until the material is brittle, then running cracks develop and the channels split open. Even moderate curvature, in the order of 15-20 ft. radius, is more than some sections will withstand.

Stout and his engineers have evolved ingenious sections made from stainless which overcome this major stumbling block to the use of the material for their purposes. Practically the only equipment needed in the fabricating shop is a forming press, specially designed rolls, and spotwelders. Such simple equipment will produce almost any desired or necessary shape for aircraft structures, economically and without anxiety over the cold-working tendencies of the material. Several of the new sections are being patented by the Stout organization; all follow basic principles hitherto unseen in the industry. The material used is 18-8 stainless from 0.005 in. thick to 0.034 in.

The wing structure is interesting to all who have observed other airplane wings, whether wood-and-fabric or metal. It consists essentially of a non-symmetrical I-beam spar, with corrugated material used for the flanges and the web. To this spar are added simply constructed ribs spaced 24 in. apart along its length. A nose piece, to

High Speed Boring Machine is Developed For U. S. Army

Chicago

• • • **The Buda Co.**, Harvey, Ill., has developed a high speed boring machine, three of which have already been delivered to the United States Army. The machines are used in the drilling of holes for explosives, anti-tank traps or land mines. Mounted on the automobile chassis they are said to be able to drill a hole 20 in. in diameter to a depth of 6 ft. in 3 min. The machine can dig holes 50 ft. in depth and as wide as 42 in. in diameter through ordinary soft rock.

form the leading edge of the wing, and a V-shaped stainless trailing-edge former are other components of the wing before the covering is welded in place. Diagonal members originally incorporated between the ribs have been eliminated as a result of tests on sample wings. The strength of the material in the ribs is such that a 6-in. length of approximately ¼ in. channel section used for the top and bottom of the ribs has withstood 95 lb. load in pure bending, applied at the center.

Over the simple framework for the wing, stainless sheet 0.005 in. thick is spot-welded with spots approximately ¼ in. apart, forming a smooth-contoured wing.

Tests on this wing have included all the usual static loadings to produce bending and torsional loads on the wing. In addition, hydraulic pressure has been applied (simultaneously with other loads) to simulate all of the actual air forces on the wing. This type of loading is distinctly an innovation in the aviation industry. In tests, the wing panel has carried its ultimate design load six times in succession, and when failure from the multiplicity of forces finally occurred, it resulted only in the distortion of some of the structure, not its complete failure. Afterward normal flight loads were imposed upon the structure without difficulty, indicating that even if failure should occur because of extreme loads on the wing structure, the stainless steel would still retain sufficient strength to support the plane in normal flight for return to its base. This is in marked contrast to wood-and-fabric construction and even to some all-metal structures in which failure of this sort would cause the structure to break up in the air.

In addition to the use of stainless, welded construction incorporating new types of structural members, the plane has a simplicity of design that further adapts it to production with low-cost tooling. It consists of a small pod or nacelle type fuselage, a monoplane wing with no exterior bracing, dual streamlined outriggers supporting the tail. The engine is installed between the outriggers, with the propeller at the rear. The plane is more highly streamlined than most of the smaller craft of today. The outriggers are stainless steel tapered tube, rolled from strip and welded. Visibility is better than that from a conventional automobile, and the passenger and pilot sit side-by-side, ahead of the wing.

The landing gear of this plane is a 4-wheeled type never seen before, incorporating the advantages of the tricycle type plus safety features and steering features not incorporated in the past. The two front wheels will be fully steerable like those of an automobile so that taxiing, even in strong cross winds, becomes a minimum problem. The tread is far less than in conventional landing gears, or in the previous tricycle type. This permits the use of single, stubby struts to support the rear wheels. No tail wheel (a requirement even with the tricycle type landing gear) is needed.

The four wheels have the advantage of the tricycle landing gear in that the pilot can land at any forward flying speed and simply "flies the airplane on to the ground," at which time he can apply the brakes fully, without danger of nosing over since the front wheels prevent that. Overturning "quarterwise" is prevented by the use of the two front wheels instead of one.

The four wheels will be mounted at the extreme ends of leaf springs projecting from the fuselage. These will be broad, flat springs, offering little air resistance and will provide automotive comfort even when taxiing on rough fields. The front wheels will be steered independently of the support, that is, they will rotate about the end of the leaf spring, just as the front wheels of an automobile rotate about the ends of the axle.

The plane will be powered by an 80 hp. motor and, carrying two persons, will have a landing speed of about 45 mph. minimum, and a top speed 115 mph. Air for the cooling of the engine will be taken in at the sides and bottoms of the fuselage and will come out through a narrow slit in the rear below the propeller housing.

New Naval Measure Would Provide 84 Warships Costing $1,200,000,000

More details of Naval expansion—Page 74

Washington

• • • **Soon after** President Roosevelt signed the Vinson naval expansion bill on Monday—a measure authorizing an 11 per cent increase in Naval strength—Congress turned its attention towards a new Naval expansion bill calling for a 22 per cent increase in the Navy by the addition of 84 ships to cost an ultimate $1,200,000,000.

The measure just signed by the President authorizes a Naval air force of 10,000 planes and 16,000 pilots and increases the fleet by 21 new ships and 22 auxiliary vessels. The new measure, discussed last week-end by Congressional leaders with President Roosevelt, would authorize the construction of three aircraft carriers; 12 cruisers; 41 destroyers and 28 submarines; and would bring to 244 the number of ships being built for the Navy.

Chairman Carl Vinson, of the House Naval Affairs Committee and sponsor of the new bill, said that a survey of private yards indicates that the program can get under way immediately if $50,000,000 is expended in industrial shipbuilding yards. The plan is to ask for an $80,000,000 deficiency appropriation to start the new program. It was estimated that the contemplated new ships can be completed in 1944.

There is considerable discussion in the East of the possibility of private shipyards going on a three-shift basis. At present most plants are operating two shifts a day. No action has been taken in this direction as yet, but the labor situation has received considerable study. Chief obstacle to three-shift operations would apparently be the lack of sufficient skilled labor.

Fabricators Ready To Help U.S. Rearm

Kansas City

• • • **At a meeting here** last week of the Midwest Structural Steel Society, representatives of 18 fabricating plants heard Robert T. Brooks of New York, executive vice-president of the American Institute of Steel Construction, and J. A. Vance of the Kansas City Structural Steel Co., president of the society, discuss the part steel fabricators may play in the national defense program.

Structural plants are well equipped, it was agreed, for their part in the rearmament program. Mr. Brooks said that most structural steel plants are running at about 40 per cent of capacity and that not much would have to be added in the way of equipment for them to produce gun carriages, welded ship parts and armor plate. In the last war, considerable steel for ships was fabricated by the industry, Brooks said.

Mr. Vance told the representatives that the average highway bridge over 20 years old cannot handle loads in excess of 20 tons, and that many will require reinforcement for military traffic such as large tanks and heavy gun carriages.

Companies represented at the meeting were: J. B. Klein Iron & Foundry Co., Oklahoma City; Capitol Steel & Iron Co., Oklahoma City; Patterson Steel Co., Tulsa, Okla.; Muskogee Iron Works, Muskogee, Okla.; Hackney Steel & Iron Co., Enid, Okla.; George C. Christopher & Sons, Wichita, Kan.; Watkins, Inc., Wichita, Kan.; Western Iron & Foundry Co., Wichita, Kan.; Capitol Steel Co., Topeka, Kan.; Topeka Foundry & Iron Works, Topeka, Kan.; Hutchinson Foundry & Iron Co., Hutchinson, Kan.; Missouri Valley Bridge & Iron Co., Leavenworth, Kan.; St. Joseph Structural Steel Co., St. Joseph, Mo.; Omaha Steel Works, Omaha, Neb.; Chillicothe Iron Works, Chillicothe, Mo.; Builders Steel Co., North Kansas City; Havens Structural Steel Co., Kansas City, and Kansas City Structural Steel Co., Kansas City, Kan.

Reich's Steel Capacity Now Doubles Britain's

• • • **German successes** in Northern France has given the Reich control of 95 per cent of the French steel industry. Taking into consideration other steel producing countries which have come under Germany's domination, that country now controls a completely integrated steel industry capable of producing 40,000,000 tons annually.

The chief problem of the German steel industry in the past has been that of obtaining sufficient ore. Close to 70 per cent of the ore consumed in its blast furnaces has been imported, chiefly from Sweden and France.

Now, with ore moving in heavy volume from the Swedish iron ore port of Lulea, and the ore beds of the Lorraine basin in France under its control, Germany is apparently assured of ample ore supplies.

Steel Town Registers, Fingerprints Aliens

McKeesport, Pa.

• • • **Registration and** finger printing of aliens in this steel town will begin next week after the city's ten "anti-fifth column" ordinances become effective. Each alien must furnish a photograph of himself for filing with finger prints. News of McKeesport's legislation has brought inquiries from St. Petersburg, Fla. and Lancaster, Pa. for copies of the measures. The central labor union of this city has pledged its support of the ordinances.

Standards Meeting on Porcelain Enamel June 26

• • • **A general conference** on proposed standards for porcelain enamel on refrigerators will be held in Washington on June 26 at the Bureau of Standards, for representatives of manufacturers, distributers and users of porcelain enamel refrigerators. The conference is open to all interested in this subject, and more than 200 organizations have been supplied with copies of the agenda of the meeting and a resume of the proposed standard as submitted to the bureau by the Porcelain Enamel Institute.

Ford Tools For Plane Engines

Detroit

• • • **Attention of machine** tool people is concentrated on the Ford Rouge plant, where they are quoting on equipment for the manufacture of Rolls Royce aircraft engines. Initial production rates are expected to run approximately 20 per 8-hr. day with the general belief that at least 200 engines a week will be produced initially. Quotations are following the pattern laid down a year ago when Ford tool designers took part in the plans for tooling the Rolls Royce engines to be produced in France or England. Since that time that project has been changed over to the Hispano Suiza, which is still being tooled from offices established by Machinery Suppliers, Inc., in the Graham-Paige plant at Detroit. Considerable other equipment is being ordered by small parts manufacturers, particularly for those who have contracts with aircraft companies.

Workmen Told "Be Ready To Tighten Your Belts"

• • • **Edgar M. Queeny,** president, Monsanto Chemical Co., in messages sent this week to the homes of employees at each of the company's 13 plants, said that "if the U. S. is to produce all that is necessary" with the greatest speed, every American must give both loyalty and cooperation." He added:

"As employees of one of the basic industries, we should recognize these changes and be prepared to tighten our belts, accept them and work hard."

Whiting Corp. Purchases Quickwork Machine Company

Chicago

• • • **The Whiting Corp.,** Harvey, Ill., has purchased the Quickwork Co., 400 W. Madison Street, Chicago, manufacturers of Quickwork metal working machinery, including shears, trimmers and power hammers. The business will be continued under the name of Whiting Corp.

Britain To Take Over French War Orders In U. S., Speed-up Sought

• • • **Great Britain will** immediately take over French airplane and other war material orders placed in the United States, Secretary of the Treasury Morgenthau said Monday at Washington. The orders are estimated to total $500,000,000.

At New York a Spokesman for the Anglo-French Purchasing Board announced that "no American manufacturer had been asked to stop production on a French order."

These developments, following capitulation of France to Germany, accompanied an announcement that the British Purchasing Commission will press for heavier and ever increasing orders of war supplies in the United States.

The Anglo-French Purchasing Board spokesman said that detailed "information regarding French purchases in the United States will be made available immediately the position is clarified. In the meantime contracts with the manufacturers are proceeding in the usual manner. Text of a statement issued by the British Purchasing Commission follows:

"Prompt and increased deliveries from the United States of America of all possible war supplies is the urgent desire of the British Purchasing Commission, for all of which the commission has ample resources. The order of the day for the British Purchasing Commission is the same as for the entire British Empire—full steam ahead.

"It was added that the needs of the British Empire in her time of trial are greater than ever before and no stone will be left unturned to see that all available supplies are rushed to the fighting forces of the Empire."

About 8500 planes have been ordered in the United States by the Allies and between 2000 and 3000 have been delivered, it was learned.

News that the British would take over French plane and munitions orders came following a telephone conversation between Secretary Morgenthau and Arthur B. Purvis, chief of the Anglo-French Board. Mr. Purvis was quoted as saying that the British would take over the French orders if the arrangements are approved by the American manufacturers.

"On the basis of the statements the President has made," Mr. Morgenthau said, "I assume we would be glad to see the British take over the French contracts."

Canada Waives Duty on Some War Materials

Toronto

After much delay and prolonged study and discussion Canadian industrial plants are being whipped into shape with all possible speed to turn out shells, guns, munitions, tanks, mechanical equipment, ships, etc., on a scale never before equalled in this Dominion.

To facilitate production of various materials and at the same time hold production costs to a minimum, the Government has introduced orders in council permitting imports of certain iron and steel materials free of duty to be used in production of war supplies. This also applies to machinery and tools.

Republic to Lift Armor Plate Output for Tanks

Cleveland

• • • **Republic Steel Corp.** plans to increase production of light armor plate for tanks and other equipment as a part of the Government's defense program. The company's statement said:

"The plan for Republic to produce light armor plate for tanks in cooperation with experienced fabricators will give the Government the advantage of this company's large productive facilities and engineering knowledge. This will go a long way in solving the problem of armored tank plate for the Government.

"Republic has under consideration extensive plans for expansion of plant and productive facilities in response to the Government's requirements in the defense program. Definite plans for these expansions are being worked out in cooperation with governmental officials and the new National Defense Commission. The company is in constant consultation with these agencies. Announcement of the plans will be made as decisions are made."

Production of 75 mm. Guns Up at Toledo

Toledo

• • • **Government work** is increasing here. One of the large Toledo auto parts makers is producing a large order of transmissions for tanks. Production of armament items at those plants which received educational orders late last year and had ample time to tool up is proceeding at a brisk pace now that the initial orders have been augmented. This is especially true of one company making 75 mm. guns, which turned out its first unit in early March and is now getting high production.

Taylor Craft Has Goal Of 2000 Planes a Year

Alliance, Toledo

• • • **Enlargement** of the Taylor Craft Aviation Corp. plant to make possible an annual production of 2000 light ships, or double the present output, is provided in a refinancing plan submitted to stockholders. Revenue from the proposed stock sale would make possible a plant addition, new machinery, and improvements to the landing field. The plant now employs 220.

Steel Institute's Yearbook Of 1939 Statistics Issued

• • • **The American Iron** and Steel Institute has issued its Annual Statistical Report for 1939 containing all production and other statistics for last year.

April Steel Output at 63.8 Per Cent

THE American Iron and Steel Institute is now publishing monthly figures on production for sale of iron and steel products, these figures having previously been issued quarterly. The first of the monthly reports is for April and is shown herewith. Reports will be issued about the last week of each month for the preceding month.

Production of all products in April is shown to be 3,005,218 net tons, of which 191,291 tons were sold to members of the industry for further conversion.

Export sales during the month were 371,532 tons, while the total for the first four months of this year was 1,674,346 tons, or more than 12 per cent of the total production.

The April output was equal to 63.8 per cent of finishing capacity. The highest rate for any product was 82.1 per cent, which was attained in cold reduced tin plate.

AMERICAN IRON AND STEEL INSTITUTE
Capacity and Production for Sale of Iron and Steel Products

April - 1940
PERIOD

		Number of companies	Items	Annual Capacity Net tons	Production for Sale—Net Tons: Current Month: Total	Current Month: Per cent of capacity	Current Month: Shipments: Export	Current Month: Shipments: To members of the industry for conversion into further finished products	To Date (4 Months 1940): Total	To Date: Per Cent of capacity	To Date: Shipments: Export	To Date: Shipments: To members of the industry for conversion into further finished products
Steel Products	Ingots, blooms, billets, slabs, sheet bars, etc.	32	1	xxxxxxx	291,776	xxx	60,180	109,232	1,365,619	xxx	376,390	473,847
	Heavy structural shapes	8	2	5,205,300	174,006	40.7	16,909	-	710,720	41.3	57,655	xxxxxxx
	Steel piling	4	3	328,000	11,200	41.6	656	-	40,378	37.2	3,789	xxxxxxx
	Plates—Sheared and Universal	19	4	5,855,450	246,916	51.4	40,091	2,065	1,124,523	58.1	127,934	12,163
	Skelp	7	5	xxxxxxx	33,344	xxx	1,004	15,787	151,548	xxx	21,166	55,335
	Rails—Standard (over 60 lbs.)	4	6	3,647,600	154,023	51.5	4,891	-	644,637	53.4	26,096	xxxxxxx
	Light (60 lbs. and under)	6	7	306,800	8,670	34.4	2,100	-	33,850	33.4	9,085	xxxxxxx
	All other (Incl. girder, guard, etc.)	2	8	118,000	2,114	21.8	850	-	13,090	33.5	2,270	xxxxxxx
	Splice bar and tie plates	15	9	1,300,200	56,270	52.7	563	-	222,426	51.7	3,318	xxxxxxx
	Bars—Merchant	35	10	xxxxxxx	255,347	xxx	38,167	19,686	1,301,250	xxx	117,318	106,406
	Concrete reinforcing—New billet	14	11	xxxxxxx	95,370	xxx	25,071	-	321,442	xxx	100,132	xxxxxxx
	Rerolling	18	12	xxxxxxx	11,702	xxx	148	-	38,732	xxx	3,626	xxxxxxx
	Cold finished—Carbon	18	13	xxxxxxx	45,798	xxx	1,435	-	209,430	xxx	3,912	xxxxxxx
	Alloy—Hot rolled	15	14	xxxxxxx	66,494	xxx	3,319	3,552	274,051	xxx	16,243	18,981
	Cold finished	14	15	xxxxxxx	6,840	xxx	489	-	30,336	xxx	979	xxxxxxx
	Hoops and baling bands	5	16	xxxxxxx	7,683	xxx	645	-	29,000	xxx	1,841	xxxxxxx
	TOTAL BARS	53	17	12,372,465	489,234	48.2	69,274	23,238	2,204,241	53.9	244,051	125,387
	Tool steel bars (rolled and forged)	15	18	110,220	5,280	58.4	211	-	21,876	60.0	943	xxxxxxx
	Pipe and tube—B. W.	13	19	1,737,860	65,587	46.0	6,114	-	261,741	45.5	27,174	xxxxxxx
	L. W.	10	20	1,360,360	24,242	21.7	3,580	-	97,355	21.6	13,402	xxxxxxx
	Electric weld	5	21	731,520	18,745	31.2	2,121	-	72,464	30.0	9,095	xxxxxxx
	Seamless	15	22	3,159,840	122,893	47.4	14,417	-	562,091	53.8	59,759	xxxxxxx
	Conduit	6	23	151,145	5,906	47.6	11	-	20,912	41.8	562	xxxxxxx
	Mechanical Tubing	13	24	554,825	18,410	40.4	973	-	89,986	49.0	4,197	xxxxxxx
	Wire rods	19	25	xxxxxxx	62,692	xxx	14,408	11,813	316,531	xxx	74,315	50,504
	Wire—Drawn	37	26	2,255,210	100,165	54.1	16,121	707	436,287	58.5	56,516	5,764
	Nails and staples	19	27	1,091,690	41,184	46.0	5,451	-	174,625	48.4	20,115	xxxxxxx
	Barbed and twisted	16	28	438,270	16,421	45.7	2,868	-	58,133	40.1	9,240	xxxxxxx
	Woven wire fence	15	29	772,790	22,223	35.0	239	-	79,741	31.2	851	xxxxxxx
	Bale ties	11	30	119,050	5,069	51.9	68	-	16,400	41.7	113	xxxxxxx
	All other wire products	6	31	27,030	1,215	54.8	-	-	3,501	39.2	-	xxxxxxx
	Fence posts	13	32	147,485	4,548	37.6	20	-	15,977	32.8	250	xxxxxxx
	Black plate	12	33	653,295	29,761	55.5	1,661	9,220	121,714	56.3	5,602	40,507
	Tin plate—Hot rolled	9	34	1,201,960	37,309	37.8	3,993	-	181,628	45.7	55,276	xxxxxxx
	Cold reduced	10	35	2,930,860	197,365	82.1	34,615	-	751,860	77.6	157,118	xxxxxxx
	Sheets—Hot rolled	26	36	xxxxxxx	309,459	xxx	32,828	10,496	1,651,427	xxx	167,806	50,802
	Galvanized	16	37	xxxxxxx	87,248	xxx	16,451	-	396,385	xxx	61,843	xxxxxxx
	Cold rolled	18	38	xxxxxxx	155,063	xxx	6,073	-	725,724	xxx	31,948	xxxxxxx
	All other	15	39	xxxxxxx	39,200	xxx	3,765	-	189,056	xxx	8,444	xxxxxxx
	TOTAL SHEETS	27	40	13,255,610	590,970	54.3	59,117	10,496	2,962,592	67.6	270,041	50,802
	Strip—Hot rolled	24	41	3,525,110	86,201	29.8	6,929	8,733	443,738	38.1	26,330	50,365
	Cold rolled	35	42	1,313,360	51,852	48.1	1,483	-	228,940	52.7	6,075	xxxxxxx
	Wheels (car, rolled steel)	5	43	419,035	14,900	43.3	296	-	73,753	53.2	1,945	xxxxxxx
	Axles	5	44	472,280	4,207	10.9	183	-	32,116	20.6	1,533	xxxxxxx
	Track spikes	11	45	327,275	10,071	37.5	135	-	39,666	36.6	1,640	xxxxxxx
	All other	3	46	9,100	449	60.1	-	-	3,544	117.7	-	xxxxxxx
	TOTAL STEEL PRODUCTS	133	47	xxxxxxx	3,005,218	xxx	371,532	191,291	13,578,203	xxx	1,674,346	864,674
	Estimated total steel finishing capacity based on a yield from ingots of 68.9 %	-	48	53,714,800	xxxxxxx	63.8	xxxxx	xxxxxxx	xxxxxxx	71.6	xxxxxxx	xxxxxxx
	Pig iron, ferro manganese and spiegel	27	49	xxxxxxx	400,247	xxx	17,479	76,525	1,709,844	xxx	96,533	431,654
	Ingot moulds	4	50	xxxxxxx	22,585	xxx	229	-	109,823	xxx	682	xxxxxxx
Iron Products	Bars	10	51	160,600	1,373	10.4	45	65	9,347	17.6	79	769
	Pipe and tubes	3	52	109,377	2,575	28.7	75	-	11,222	31.0	445	xxxxxxx
	All other	3	53	71,180	776	13.3	1	154	4,070	17.3	811	1,158
	TOTAL IRON PRODUCTS (ITEMS 51 to 53)	12	54	276,247	4,724	20.8	121	219	24,639	27.0	1,335	1,927

Total Number of Companies Included - 133

Total steel products produced for sale, less shipments to members of the industry for conversion into further finished products: Current month 2,813,927 *N.T.;* 63.8 *% of Finishing Capacity.*
To date 12,713,529 *N.T.;* 71.6 *% of Finishing Capacity.*
The above tonnages represent 68.9 *% of the ingots produced by companies whose products are included above.*

Personals

Change is inevitable in progressive Industry. Change is constant.

• **J. S. Billingsley,** who has been identified with the Crucible Steel Co. of America, in its Pittsburgh branch office since 1930, has been appointed manager of that office, succeeding the late M. Stuart Dravo. He started with the Crucible organization at the New York office in 1923 after receiving his master's degree from Columbia University. He was later engaged in sales activity at the Syracuse and Pittsburgh branches of the company.

• **William Creider,** formerly general manager of the Oilgear Co., Milwaukee, has been made machine tool sales manager of the Cimatool Co. and sales manager of the Sheffield Gage Corp., Dayton. He has had a long experience in the metal-working field. He started his career with the Union Switch & Signal Co., Swissvale, Pa., and was identified with the Oilgear Co. for 17 years, for 12 of which as general manager.

• **J. H. Slater,** formerly superintendent of blast furnaces and coke works of the Cleveland district of Republic Steel Corp., has been appointed assistant manager in charge of steel works. **H. H. Holloway,** present assistant Cleveland district manager, has been placed in charge of all finishing mills. **B. W. Norton,** assistant district manager at Youngstown, has been transferred to the same position in the Warren district. **J. H. Graft,** assistant district manager at Warren, is transferred to Youngstown as assistant district manager. **M. D. Wald,** formerly superintendent of the coke ovens in the Cleveland district, succeeds Mr. Slater as superintendent of the blast furnaces, coke ovens, and docks.

C. M. Schoenlaub, assistant superintendent of the Warren open hearth department, has been made assistant superintendent of the Cleveland open hearth department, and **B. D. McCarthey,** assistant superintendent of the Cleveland open hearth department, has been transferred to Warren in the same capacity.

William Rodgers, formerly chief metallurgist at Buffalo, has been appointed chief metallurgist of the Cleveland district, with **P. P. Echols,** formerly chief metallurgist at Warren, as assistant chief metallurgist.

J. J. Bowden, formerly chief metallurgist of the Cleveland district, returns to the Warren district as chief metallurgist, and **J. D. Dickerson,** formerly assistant chief metallurgist at Buffalo, has been named chief metallurgist.

• **H. G. Coffey** has been advanced to the post of manager of sales for Aetna-Standard Engineering Co., Youngstown, Ohio. Formerly he was assistant manager of sales. Mr. Coffey joined the Aetna Foundry & Machine Co., predecessor of Aetna-Standard Engineering Co., in a sales capacity about 15 years ago, after service with Youngstown Sheet & Tube Co.

J. S. BILLINGSLEY, new manager of the Pittsburgh office of Crucible Steel Co. of America.

• **C. L. Knotts,** Westinghouse Electric & Mfg. Co., has been elected chairman of the Sharon section of the American Institute of Electrical Engineers.

• **John J. Borrup,** who has been associated with Pratt & Whitney aircraft division of United Aircraft Corp., since its founding in 1925, as superintendent and later as factory manager, has been appointed to the new post of production manager. He will be responsible for supervising the production of Pratt & Whitney aircraft's sub-contractors and coordinating this with its own production facilities. Previous to his association with the company, he was employed in various production capacities by the Crane-Simplex Motor Co., the Wright-Martin Co., and the Wright Aeronautical Corp.

• **G. H. D. Miller,** the newly appointed factory manager, has been assistant factory manager since 1935 and prior to that served as technical adviser to the Argentine Government for two years. He was also formerly identified with the Wright Aeronautical Corp. and the Curtiss Aeroplane & Motor Co.

• **Daniel Jack,** who has been associated with the company since 1925, has been made assistant factory manager. He came to the United States from Scotland in 1908 and received a thorough grounding in machine shop practice in plants of several car and aircraft engine manufacturers.

• **John Weiler** has been named president of the Mullins Body & Tank Co., Milwaukee, succeeding **C. J. Mullins,** who is no longer associated with the company. Announcement was made by **W. H. Hammond,** sales manager of the hoist and body division, Gar Wood Industries, Inc., Detroit, for which the Mullins organization is a distributer.

• **Carl J. Halborg** has been elected president of Colonial Broach Co., Detroit, to succeed the late Otto Lundell. Mr. Halborg, who was previously secretary of the company, has been associated with Colonial since its organization in 1918. Elected vice-presidents are **A. G. Lundell** and **Arvid Lundell,** the latter in charge of manufacturing. **David A. Nelson** has been named secretary and treasurer.

• **W. L. Gourley** has been elected president of the Lehmann Machine Co., St. Louis, succeeding **Paul Lehmann,** who has disposed of his interests in the company, but who will remain for the next year.

M. E. Robbins, heretofore a member of the New York district sales office of the Universal Gear Corp., Indianapolis, has been appointed assistant director of sales and in direct supervision of all Eastern sales districts, with headquarters in the Lincoln Building.

J. Y. Dahlstrand, for the past two years chief engineer for Universal Gear, has been made director of sales and engineering for the corporation. He was formerly associated in engineering and sales capacities with the Murray Iron Works Co., Kerr Turbine Co., Westinghouse Electric & Mfg. Co., and the Allis-Chalmers Mfg. Co.

• **Frederick G. Hughes,** general manager of New Departure, division of General Motors, Bristol, Conn., has been reelected president of the Manufacturers Association of Hartford County.

• **R. F. Thalner,** has been named personnel director of the Buick division of General Motors Corp. succeeding the late Elmer H. Kramer. Mr. Thalner has been engaged in personnel service at the Buick factory for more than 20 years. Joining the organization in 1919 as safety inspector, he became director of that department in that same year. He is credited as safety director with having greatly reduced the frequency of severity rate of industrial accidents and with having instituted plant-wide safety measures noted for their effectiveness. In 1936 he was made assistant personnel director. He is a native of Ironwood, Mich., a graduate of the University of Michigan, 1915. Prior to the last World War he was with the Ford Motor Co.

• **William A. Ruehl,** traffic manager of the Cleveland lamp department of General Electric Co., has been elected president of the Traffic Club of Cleveland. **M. K. DeWitt,** Lamson & Sessions Co., was elected secretary and **John S. Schwalm,** General Electric Co., treasurer.

• **Harry J. Swanson,** vice-president and treasurer of the Ottawa Steel

WILLIAM CREIDER, machine tool sales manager of Cimatool Co. and sales manager of the Sheffield Gage Corp., affiliated companies.

Products Inc., Grand Haven, Mich., manufacturer of precision parts for the automotive, diesel engines and other industries, has announced his resignation from the company and the sale of his interest to **H. H. Nygren,** his partner since 1924. The firm, organ-

M. M. CADMAN, whose appointment as director of raw materials, Carnegie-Illinois Steel Corp., was announced in these columns last week.

ized in Detroit in 1922, moved to Grand Haven in 1927.

• **Howard T. Lewis,** professor of marketing and director of research, Graduate School of Business Administration, Harvard University, recently was awarded the J. Shipman Gold Medal at the international convention of the National Association of Purchasing Agents, held at Cincinnati two weeks ago, for "his contribution to the education of those about to engage in purchasing, by writing and editing of textbooks, by the establishment at our leading school of business administration of a course that critically analyzes and evaluates the function of purchasing, by the influence that course has had on other schools of business administration and by his efforts to establish in business the recognition of equality of the purchasing function with the other major functions of business."

• **Thomas A. Julian,** formerly secretary-treasurer of the Metal Saw & Machine Co., Springfield, Mass., is now associated with the Van Norman Machine Tool Co.

• **James M. Slattery,** in charge of raw material purchases for the Fisk division of the United States Rubber Co. has been made director of purchases by the Mansfield Tire & Rubber Co., Mansfield, Ohio. Mr. Slattery was associated with the Fisk Rubber Co. since June, 1916.

• **Edward H. Moll,** previously factory manager of the American Bosch Corp., has been made vice-president in charge of production, and **Foster N. Perry,** formerly in charge of the New York and Chicago offices, has been made vice-president in charge of sales.

• **Frank E. Billings** has been elected president and treasurer of the Worcester Stamped Metal Co., Worcester, Mass. **Carl F. Carlstrom** has been made vice-president and general manager, and **Wayne E. Billings,** secretary.

• **H. L. Geiger,** of the Chicago office of the development and research division of the International Nickel Co., Inc., New York, was scheduled to discuss "The Role of Nickel in the Production of Farm Tools" before the power and machinery division of the American Society of Agricultural

Engineers at State College, Pa., June 19.

• **Arthur Frank,** personnel manager of the Heil Co., Milwaukee, was reelected president of the Industrial Relations Association of Wisconsin at its annual meeting in Milwaukee. Other officers named were: vice-president, **Allen Weston,** Wisconsin Industrial Commission; secretary, **Arthur Coutoure,** George J. Meyer Co.; treasurer, **O. D. Eicher,** Ladish Drop Forge Co., and directors, **Walter Meyer,** Plankinton Packing Co., and **Len Bartell,** Maynard Electric Steel Casting Co.

• **J. D. Mooney,** vice-president in charge of the overseas group of General Motors Corp., New York, has been relieved of his responsibilities in this connection, and has been transferred to Detroit as executive assistant to **C. E. Wilson,** acting president, in full charge of all negotiations involving defense equipment, and of such liaison activities as may be necessary in connection with the engineering and production of same. **Graeme K. Howard,** vice-president and general manager of the overseas group, New York, will assume general supervision of that group, succeeding Mr. Mooney. **Albert Bradley,** vice-president in charge of finances, New York, has been transferred to Detroit, and will assume additional duties as executive assistant to Mr. Wilson. These changes and assignments are of an emergency character and have necessarily no bearing on the corporation's normal staff responsibilities and have been made to facilitate an aggressive execution of such part of the national defense program as may be assigned to General Motors.

• **Henry A. Roemer,** president, Sharon Steel Corp. and Pittsburgh Steel Co., said at Peoria, Ill., last week that "it is the duty of every American today to prepare his mind and to get his house in order to defend his country."

Mr. Roemer, a keynote speaker at the annual banquet of the Keystone Steel & Wire Co.'s "25-Year Club," warned in an interview earlier in the day that "some people believe American manufactured goods will be widely sought after the war, even if Germany wins. I think this is out of the question."

Obituary

• **William Fahey,** president of the Cleveland Screw Products Co. since it was incorporated in 1915, died June 9 in Cleveland after a long illness. He was 72 years old.

• **Harry E. Figgie,** vice-president, Standard Steel Spring Co., Coraopolis, Pa., died June 13 in White Sulphur Springs, W. Va. A graduate of Case School of Applied Science in the class of 1909, he was sales manager of the Standard Parts Co. prior to going with the spring company.

• **Daniel Russell,** treasurer of the Daniel Russell Boilers Works, South Boston, died on June 11. He was born in South Boston 73 years ago.

• **Max Cohen,** owner of the Everett-Chelsea Iron & Steel Co. Everett, Mass., died on June 14. He was born in Russia 62 years ago and early in life came to America. Mr. Cohen was prominently identified with the New England scrap industry, having been in business approximately 40 years.

• **Clarence A. Thatro,** vice-president and assistant general manager of the Trane Co., LaCrosse, Wis., died June 13 at the age of 37.

• **John E. Pasbrig,** for 50 years an employee of International Harvester Co. at Milwaukee and foreman of the core room until he became ill several months ago, died June 9 at his home there.

• **Henry Bond,** secretary-treasurer of the Ross-Meehan Foundries, Chattanooga, Tenn., died at the Alexian Brotherhood Rest Home on Signal Mountain, Tenn., June 6, after a long illness. Mr. Bond joined Ross-Meehan Foundries in 1919 as auditor and was promoted to assistant secretary-treasurer, and then, in 1925, to secretary-treasurer, in which position he remained up until his death. He was 54 years old.

• **David H. Petherick,** the oldest employee of United States Radiator Co. in point of service, died June 1 at Detroit. He learned the steamfitting trade in Detroit as a young man and then entered the employ of the United States Heater Co. which later became the United States Radiator Corp. He was employed as a sales engineer for many years and for a time served as manager of the company's Detroit branch. He was 72 years old.

• **Russell Scott,** past-president of the American Foundrymen's Association and an employee of Packard Motor Car Co. for more than 30 years, died at Detroit on May 30. Mr. Scott, who was 55 years old, went with Packard in June, 1905, and retired in October, 1935. For the first 15 years of his employment he was in the pattern shop and for the other 15 in the foundry. He entered supervisory service in 1913 and when transferred to the foundry department, he became assistant superintendent and then superintendent.

• **Lawrence E. Scrannage,** general manager of forging division of Phoenix Mfg. Co., and formerly general superintendent of Cleveland Hardware & Forging Co., Cleveland, died June 16, aged 48 years.

• **Alonzo R. Marsh,** owner of A. R. Marsh Machinery Co., Cleveland, died June 14. He went to Cleveland in 1920 from Brockton, Mass., where in the World War he designed and built special machines for the manufacture of shells. In the early 1900's Mr. Marsh engaged in the manufacture of motorcycles in the plant of the American Motor Co., Brockton. He was 65 years old.

• **Perry B. Riale,** representative of The Milton Mfg. Co., Milton, Pa., in the New York metropolitan territory for 16 years, the last 12 as district sales manager, died in the Knickerbocker Hospital, in the latter city, on June 15. He was 59 years old.

Metal Working Activity

. . . *Latest Data Assembled by The Iron Age*

From Recognized Sources. In Net Tons.

	May 1940	April 1940	March 1940	April 1939	4 Months 1940	4 Months 1939
Steel Ingots:						
Monthly output[a]	4,841,403	3,974,706	4,264,755	3,352,774	18,303,811	14,139,679
Average weekly output[a]	1,092,867	926,505	962,699	781,532	1,058,636	824,471
Per cent of capacity[a]	72.00	61.04	63.42	51.11	69.75	53.91
Pig Iron:						
Monthly output[b]	3,513,683	3,137,019	3,270,499	2,302,918	13,751,020	9,728,770
Raw Materials:						
Coke output[c]		4,086,747	4,771,030	2,934,560	17,464,005	13,034,807
Lake ore consumption[d]		4,407,035	4,578,299	3,135,741	19,660,219	13,323,191
Scrap consumption[r]	3,353,000	3,083,000	3,283,840	2,595,000	14,016,000	10,930,242
Castings:						
Malleable, orders[e]		35,290	35,730	29,183	146,359	136,519
Steel, orders[e]		34,388	36,612	34,388	161,999	150,722
Finished Steel:						
Trackwork shipments[a]		.....	8,446	6,819	.....	20,459
Fabricated shape orders[f]		63,506	128,321	118,309	372,398	397,805
Fabricated plate orders[e]		36,213	35,435	35,844	131,276	109,042
U. S. Steel Corp. shipments[g]		907,904	931,905	771,752	3,994,657	3,235,153
Fabricated Products:						
Automobile production[h]		422,000††	423,299	337,375	1,681,027††	1,354,709
Steel furniture shipments[e]		$2,008,428	$2,424,300	$1,619,218	$8,960,330	$7,165,228
Steel boiler orders[e] (sq. ft.)		878,259	760,668	764,996	2,731,490	3,329,637
Locomotives ordered[i]	20	50	40	19	136	93
Freight cars ordered[i]	2,081	1,812	1,076	2,695	4,259	5,702
Machine tool index[j]	92.5	93.4	93.4	61.2	93.2†	58.7†
Foundry equipment index[k]		192.9	243.4	146.0	205.3†	142.8†
Non-Ferrous Metals: (U. S.)						
Lead shipments[l]		46,563	46,353	37,903	171,967	153,384
Lead stocks[l]		63,463	74,692	123,394	.....	.....
Zinc shipments[m]	59,177	46,978	51,095	40,641	287,533	168,399
Zinc stocks[m]	75,036	81,234	73,611	130,380	.....	.....
Tin deliveries[n] (gross tons)	7,905	7,855	9,244	5,980	19,170	33,479
Refined copper deliveries[o]	69,467	68,665	64,376	42,484	287,684	192,613
Refined copper stocks[o]	178,664	169,120	159,795	332,513	.....	.....
Exports:						
Total iron and steel[p]		612,906	743,658	394,008	2,531,708	1,781,618
Rolled and finished steel[p]		270,330	357,722	134,478	1,208,344	150,615
Semi-finished steel[p]		96,609	115,027	8,849	362,820	9,911
Scrap[p]		221,152	231,759	241,780	850,253	1,115,578
Imports:						
Total iron and steel[p]		6,674	5,096	49,373	26,784	116,265
Pig iron[p]		286	583	3,933	4,815	8,359
Rolled and finished steel[p]		32,587	2,474	36,497	8,379	75,453

†Three months' average. •Not available. ††Preliminary.

Source of data: [a] American Iron and Steel Institute; [b] THE IRON AGE; [c] Bureau of Mines; [d] Lake Superior Iron Ore Association; [e] Bureau of the Census; [f] American Institute of Steel Construction; [g] United States Steel Corp.; [h] Preliminary estimates by THE IRON AGE—Final figures from Bureau of the Census, U. S. only; [i] *Railway Age;* [k] Foundry Equipment Manufacturers Association; [l] American Bureau of Metal Statistics; [m] American Zinc Institute; [n] New York Commodity Exchange; [o] Copper Institute; [p] Department of Commerce; [r] Institute of Scrap Iron and Steel.

The Iron Age Comparison of Prices

Advances Over Past Week in Heavy Type; Declines in Italics

	June 18, 1940	June 11, 1940	May 21, 1940	June 20, 1939
Flat Rolled Steel:				
(Cents Per Lb.)				
Hot rolled sheets	2.10	2.10	2.10	2.00
Cold rolled sheets	3.05	3.05	3.05	3.05
Galvanized sheets (24 ga.)	3.50	3.50	3.50	3.50
Hot rolled strip	2.10	2.10	2.10	2.00
Cold rolled strip	2.80	2.80	2.80	2.80
Plates	2.10	2.10	2.10	2.10
Tin and Terne Plate:				
(Dollars Per Base Box)				
Tin plate	$5.00	$5.00	$5.00	$5.00
Manufacturing ternes	4.30	4.30	4.30	4.30
Bar and Shapes:				
(Cents Per Lb.)				
Merchant bars	2.15	2.15	2.15	2.15
Cold finished bars	2.65	2.65	2.65	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Wire and Wire Products:				
(Cents Per Lb.)				
Plain wire	2.60	2.60	2.60	2.60
Wire nails	2.55	2.55	2.55	2.45
Rails:				
(Dollars Per Gross Ton)				
Heavy rails	$40.00	$40.00	$40.00	$40.00
Light rails	40.00	40.00	40.00	40.00
Semi-Finished Steel:				
(Dollars Per Gross Ton)				
Rerolling billets	$34.00	$34.00	$34.00	$34.00
Sheet bars	34.00	34.00	34.00	34.00
Slabs	34.00	34.00	34.00	34.00
Forging billets	40.00	40.00	40.00	40.00
Wire Rods and Skelp:				
(Cents Per Lb.)				
Wire rods	2.00	2.00	2.00	1.92
Skelp (grvd.)	1.90	1.90	1.90	1.90

	June 18, 1940	June 11, 1940	May 21, 1940	June 20, 1939
Pig Iron:				
(Per Gross Ton)				
No. 2 fdy., Philadelphia	$24.84	$24.84	$24.84	$22.84
No. 2, Valley furnace	23.00	23.00	23.00	21.00
No. 2, Southern Cin'ti	23.06	23.06	23.06	21.06
No. 2, Birmingham	19.38	19.38	19.38	17.38
No. 2, foundry, Chicago†	23.00	23.00	23.00	21.00
Basic, del'd eastern Pa.	24.34	24.34	24.34	22.34
Basic, Valley furnace	22.50	22.50	22.50	20.50
Malleable, Chicago†	23.00	23.00	23.00	21.00
Malleable, Valley	23.00	23.00	23.00	21.00
L. S. charcoal, Chicago	30.34	30.34	30.34	28.34
Ferromanganese‡	100.00	100.00	100.00	80.00

†The switching charge for delivery to foundries in the Chicago district is 60c. per ton. ‡For carlots at seaboard.

	June 18, 1940	June 11, 1940	May 21, 1940	June 20, 1939
Scrap:				
(Per Gross Ton)				
Heavy melting steel, P'gh.	$20.75	$20.25	$18.75	$15.25
Heavy melting steel, Phila.	20.25	19.50	17.75	15.50
Heavy melting steel, Ch'go	18.75	17.75	17.25	13.50
Carwheels, Chicago	19.00	19.00	18.75	12.75
Carwheels, Philadelphia	22.75	20.75	20.75	16.00
No. 1 cast, Pittsburgh	20.75	20.25	19.25	15.25
No. 1 cast, Philadelphia	22.25	20.75	20.25	16.25
No. 1 cast, Ch'go (net ton)	17.25	17.00	16.75	12.25
Coke, Connellsville:				
(Per Net Ton at Oven)				
Furnace coke, prompt	$4.00	$4.00	$4.00	$3.75
Foundry coke, prompt	5.25	5.25	5.25	4.75
Non-Ferrous Metals:				
(Cents per Lb. to Large Buyers)				
Copper, Electro., Conn.*	11.50	11.50	11.50	10.00
Copper, Lake, New York	11.50	11.50	11.50	10.00
Tin (Straits), New York	*52.50*	57.00	54.00	49.125
Zinc, East St. Louis	6.25	6.25	5.75	4.50
Lead, St. Louis	4.85	4.85	4.85	4.70
Antimony (Asiatic), N. Y.	16.50	16.50	16.50	14.00

*Mine producers only.

The various basing points for finished and semi-finished steel are listed in the detailed price tables, pages 107 to 116. On export business there are frequent variations from the above prices. Also in domestic business, there is at times a range of prices on various products, as shown in our detailed price tables.

Composite Prices . . .

	FINISHED STEEL	PIG IRON	SCRAP STEEL
June 18, 1940	2.261c. a Lb.	$22.61 a Gross Ton	$19.92 a Gross Ton
One week ago	2.261c. a Lb.	$22.61 a Gross Ton	$19.17 a Gross Ton
One month ago	22.61c. a Lb.	$22.61 a Gross Ton	$17.92 a Gross Ton
One year ago	2.236c. a Lb.	$20.61 a Gross Ton	$14.75 a Gross Ton

	FINISHED STEEL High	FINISHED STEEL Low	PIG IRON High	PIG IRON Low	SCRAP STEEL High	SCRAP STEEL Low
1940	2.261c., Jan. 2	2.211c., Apr. 16			$19.92, June 18	$16.04, Apr. 9
1939	2.286c., Jan. 3	2.236c., May 16	$22.61, Sept. 19	$20.61, Sept. 12	22.50, Oct. 3	14.08, May 16
1938	2.512c., May 17	2.211c., Oct. 18	23.25, June 21	19.61, July 6	15.00, Nov. 22	11.00, June 7
1937	2.512c., Mar. 9	2.249c., Jan. 4	23.25, Mar. 9	20.25, Feb. 16	21.92, Mar. 30	12.92, Nov. 10
1936	2.249c., Dec. 28	2.016c., Mar. 10	19.73, Nov. 24	18.73, Aug. 11	17.75, Dec. 21	12.67, June 9
1935	2.062c., Oct. 1	2.056c., Jan. 8	18.84, Nov. 5	17.83, May 14	13.42, Dec. 10	10.33, Apr. 29
1934	2.118c., Apr. 24	1.945c., Jan. 2	17.90, May 1	16.90, Jan. 27	13.00, Mar. 13	9.50, Sept. 25
1933	1.953c., Oct. 3	1.792c., May 2	16.90, Dec. 5	13.56, Jan. 3	12.25, Aug. 8	6.75, Jan. 3
1932	1.915c., Sept. 6	1.870c., Mar. 15	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.43, July 5
1931	1.981c., Jan. 13	1.883c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.192c., Jan. 7	1.962c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.236c., May 28	2.192c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3

Based on steel bars, beams, tank plates, wire, rails, black pipe, sheets and hot-rolled strip. These products represent 85 per cent of the United States output.

Based on average for basic iron at Valley furnace and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

Summary of the Week

• Steel mills and other manufacturers cease work, at least temporarily, on French orders, which Britain may take over . . . Steel orders heavy and operations are higher . . . Scrap prices continue to rise

PRODUCTION of semi-finished and finished steel for France was at least temporarily suspended this week, pending clarification of the situation abroad.

Although the Anglo-French Purchasing Board issued a statement that "No American manufacturer has been asked to stop production on a French order," various complications immediately arose which caused steel companies and other manufacturers to cease fabrication of material.

The British may take over some of the orders, as they have already announced they will do in the case of airplanes and engines, but there are some products in process here which obviously cannot be shipped to France, as for example airplane parts for a French manufacturer situated near Paris.

Much of the French steel business has been placed within the past few weeks and comparatively little has been processed. A considerable additional volume was under negotiation. Orders on mill books are mainly for shell billets and bars, plates, alloy steel, barbed wire and tin plate.

Some manufacturers engaged in work for France on trucks, trailers and other equipment have not only stopped work, but have suspended orders for the steel required for further manufacture.

The machine tool industry, which has French orders for many millions of dollars worth of tools, will quickly readjust itself to the changed situation as there will be an almost immediate need for the capacity thus released in the building of tools for the United States defense program, in addition to which there is an insistent demand from Canada and Great Britain. Production of machine tools is expected to continue without abatement.

WHILE steel ingot production did not advance this week as much as might have been expected had work not ceased on French orders, the rate for the country gained a point and a half to 87 per cent, slightly above the best rate of last January.

If, as expected, the British take over most of the French contracts and add to these the additional heavy requirements that are now under discussion, there will be no immediate letdown, but probably a further gain, in steel production. There is a disquieting thought, however, in the minds of manufacturers engaged in war work as to whether Britain can long hold out in the event that Germany obtains possession of the French navy. The ending of the war would undoubtedly bring a sharp downturn until such time as the United States defense program gets fully under way.

German steel companies are offering steel in South American countries at prices below American quotations with a cash guarantee of delivery by October, thus carrying out the Reich's "time table" tactics to the point of planning for post-war trade re-establishment. German successes have given the Reich 95 per cent control of the French steel industry, which, with Germany's own capacity and that of Belgium-Luxembourg, totals about 40,000,000 tons annually. In addition, Germany now has access to the Lorraine ore basin to add to the iron ore she is receiving from Sweden.

THIS situation emphasizes the aid that Great Britain and Canada will require from the steel industry of the United States, if the war is prosecuted by the British Empire alone. In order to facilitate its own war manufacturing, Canada has issued an order-in-council waiving duties on some iron and steel products needed for war supplies.

Moreover, our own national defense program has as yet made only a dent in our steel capacity. Although appropriations have been made by Congress and some contracts awarded, notably for Naval shipbuilding, steel orders are not yet being received by the mills in large volume for such work. Other than export tonnage, much of the current steel business is from domestic fabricators not yet engaged in war work. Nevertheless tonnage on the books of the mills is expanding at a rapid rate, backlogs are being built up and deliveries are extended.

The Navy Department has provided for the construction of 22 ships under the Vinson Naval expansion bill, on top of which comes a new bill before Congress calling for 84 additional ships.

Railroad equipment buying is increasing and may develop soon into a major program. Automobile companies are on the verge of placing large orders for 1941 model production.

Scrap prices continue to advance, although the French situation has had a slightly sobering effect. Meanwhile, THE IRON AGE scrap composite price has risen for the tenth consecutive week and is now at $19.92, a gain of 75c. over last week.

The Industrial Pace . . .

ALTHOUGH THE DOMESTIC defense program has not yet reached the point where volume orders are going to industry, output of the heavy industries continues to expand counterseasonally, supported by domestic business and, in some phases of the industry, Allied buying.

Reflecting the increased tempo of activities in the heavy industries, THE IRON AGE index of capital goods activity rose 2.4 points in the past week to 84.8 per cent of the base years. This advance brings the index to the highest position reached since the week of Feb. 10.

Three components of the index rose, while two declined. Chief increase, on a weighted basis, was again shown by the steel series. The index of this component, 122.3, is only two points below the high of the current year recorded in the first week of January. Actually, output on a percentage basis this week is a point above the previous high for 1940 and 7.5 points below the 1939 peak.

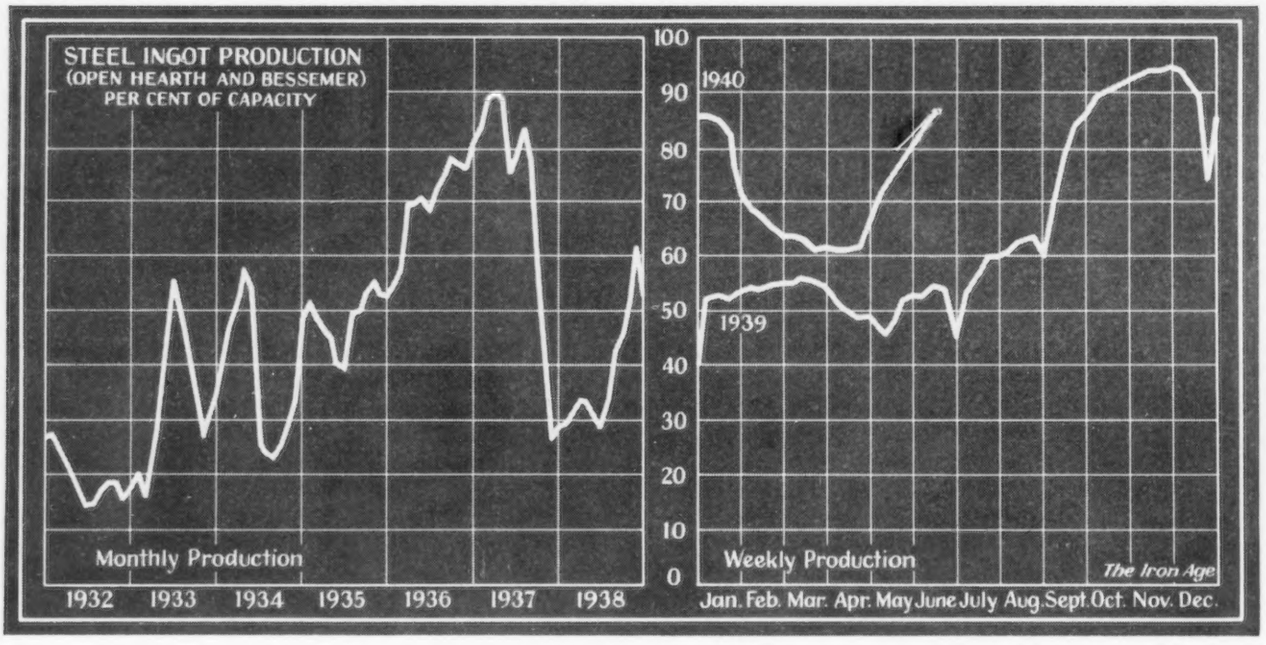
Automobile series was off fractionlaly, indicating that the gradual dropping off in assemblies is very close to seasonal expectations. Heavy construction component again moved higher, with privately financed work figuring importantly in the week's awards. Total dollar value of awards made in the past week was $56,641,000, close to $8,000,000 below the preceding week, but over $3,000,000 above the average of the past three months. The week's loss was due entirely to public projects; prviate awards advancing 100 per cent over the previous week.

Among the larger private contracts placed in the week was one for a chemical plant for Union Carbide & Carbon Corp. at Texas City, Tex., valued at $2,600,000, and a blast furnace for National Tube Co. valued at $500,000.

The declining trend of shipments of finished steel by U. S. Steel Corp. since the first of the year was reversed in May. Deliveries in that month were 1,084,057 net tons, as compared with 907,905 in the previous month and 795,689 in May, 1939. The May total is the largest since January of the present year when 1,145,592 tons was shipped.

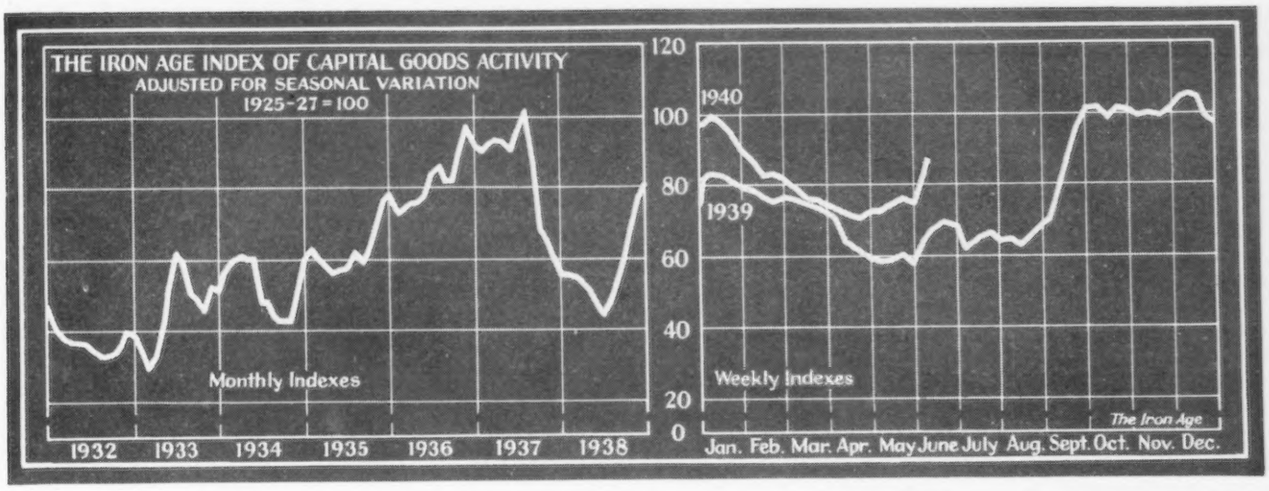
The sudden reversal of steel ingot operations at the end of April brought increased interest in steel scrap. This new interest, in face of the generally low level of dealers' stocks resulted in a steady rise in THE IRON AGE composite scrap price which reached a new high for the year. The current week's quotation of $19.92 compares with the previous high of $17.67 (before the present advance) in the first week of January and $22.50 the 1939 high recorded in the week of Oct. 3.

Steel Output at 87% Reaches New High for 1940



District Ingot Production, Per Cent of Capacity	Pitts-burgh	Chicago	Valleys	Phila-delphia	Cleve-land	Buffalo	Wheel-ing	Detroit	Southern	S. Ohio River	West-ern	St. Louis	East-ern	Aggre-gate
Current Week	82.0	93.0	82.0	85.0	82.0	100.0	99.0	95.5	92.0	87.5	71.0	73.5	50.0	**87.0**
Previous Week	82.0	92.0	77.0	84.0	81.0	100.0	99.0	100.0	89.0	84.0	71.0	73.5	50.0	**85.5**

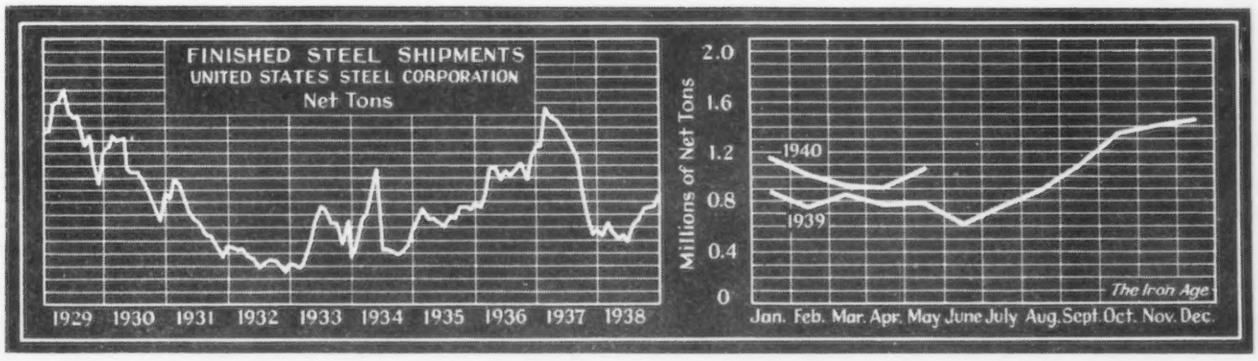
Capital Goods Index Advances 2.4 Points to 84.8



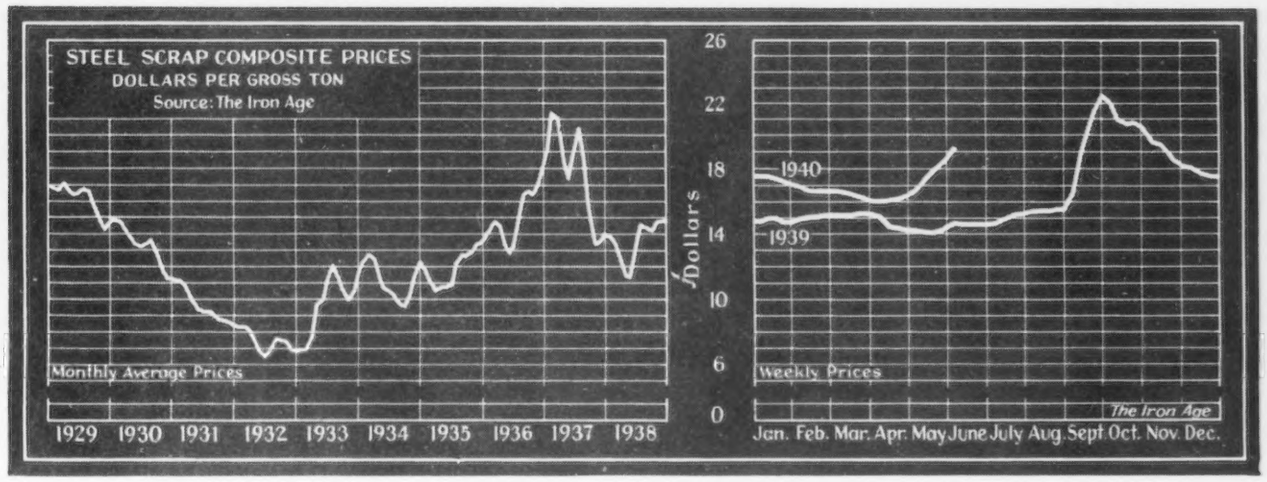
Components — Week Ended →	June 15	June 8	May 18	June 17 1939	June 15 1929
Steel ingot production[1]	122.3	111.3	90.8	75.8	137.0
Automobile production[2]	83.0	84.4	83.7	70.0	131.1
Construction contracts[3]	55.3	54.3	52.4	75.4	118.9
Forest products carloadings[4]	61.2	63.6	58.9	53.3	121.6
Pittsburgh output and shipments[5]	101.4	98.2	87.4	67.1	128.5
COMBINED INDEX	84.8	82.4	74.6	68.3	127.4

Sources: [1] THE IRON AGE; [2] Wards Automotive Reports; [3] *Engineering News-Record*; [4] Association of American Railroads; [5] University of Pittsburgh. The indexes of forest products carloadings and activity in the Pittsburgh area reflect conditions as of the week ended June 8. Other indexes cover the week of June 15.

May Shipments of U. S. Steel Corp. Approach January Level



Steel Scrap Composite Price Establishes New 1940 High



Market News

. . . THE WEEK'S ACTIVITIES IN IRON AND STEEL

Steel Operations

. . . Ingot Output Up a Point and a Half to 87 Per Cent

Owing to the suspension of work on some French steel orders this week, operations of the steel industry did not show the gain that might otherwise have been expected. THE IRON AGE estimate of production for the week is 87 per cent, a gain of a point and a half over last week's estimated output.

There has been no change at Pittsburgh, where the rate remains at 82 per cent, but Chicago is up one point to 93 per cent, Youngstown has gained five points to 82 per cent, Eastern Pennsylvania is a point higher at 85 per cent, Cleveland is also one point up at 82 per cent, the Birmingham district has gained to 92 per cent and the Southern Ohio district is up three and a half points to 87½ per cent.

The Buffalo district remains at 100 per cent, the Wheeling-Weirton area is at 99 per cent, while Detroit, which last week reported full operation, is down to 95 per cent, the only decline.

New Business

. . . French orders suspended by mills pending clarification of situation

Production on French government semi-finished and finished steel orders has been suspended by the mills, pending clarification as to the ultimate disposition of the material. A possibility that the British may take over these commitments, but no decision has been reached as yet as regard to French steel orders, even though the British have definitely decided to take over French airplane orders. If the English were to assume the French steel commitments or even if the United States were eventually to take some of the steel in process or unshipped, such tonnages taken would only replace steel which the British or the American government would have purchased anyway. Hence the suspension of the French steel orders constitutes a net loss of this business.

At CLEVELAND the French had on order a wide variety of semi-finished and finished steel, including shell steel. Negotiations were under way for more tonnage. In addition, considerable material such as alloy steel and sheets was destined for France after manufacture into airplane parts and truck bodies. Some of the latter steel was promptly ordered held up or cancelled by manufacturers, despite the fact no cancellations had been received from the French buyers.

Aggregate steel orders from June 1 to 15 were well ahead of capacity at CLEVELAND and YOUNGSTOWN. Railroad and automotive buying is expected and overshadowing the whole picture is heavy buying for the United States rearmament program, which will probably be hastened by recent developments.

The volume of new business going to CHICAGO mills is more than supporting the current district rate of 93 per cent, and backlogs are being built up each week. Manufacturers of farm and industrial tractors and agricultural implements are running near capacity in some instances and demand from them for bars, sheets and small shapes is good. Skelp and pipe are active, the latter principally because of a sharp increase in the number of residential buildings going up in this district. Over 1500 box cars were offered in that district in the last two weeks as well as 5000 tons of rails. The current high operations of the steel industry have been attained with almost no support from the railroads but it now appears that a buying period is in prospect from the carriers. More secondary rail buying will probably be seen this month and it is almost certain that additional large car programs will be abandoned soon.

Sheet specifications are still being received in good volume and it is likely that shipments will extend through July and perhaps into August. Some small tonnages have been taken in the last week or so at the full price of 2.10c. and this price will apply on all sheets ordered from now on.

Ford Motor Co., which is known to have placed small quantities of steel to wind up 1940 model production, is taking initial steps to place 1941 requirements this week. According to a company spokesman, Ford will purchase such quantities as are required to start production and will make provisions for obtaining such steel only as fast as releases on parts are actually effected through the final O.K. of dies. It was indicated that about 40 per cent of the 1941 dies have been approved after checking and it was believed that material for these parts would be ordered. From other sources it is known that initial requirements will be based upon the production of 150,000 cars and trucks. Also it is known that delivery of materials to the Rouge plant will begin by mid-July with the first parts and bodies to be produced the week of July 22. Cars, however, will not be available until approximately auto show time in October.

In NEW YORK records are being broken in the volume of business being placed. An independent company had in May the largest total volume it has ever booked in the NEW YORK district and its orders this month are running ahead of those of last month.

New bookings in Philadelphia in the past week are maintained at the high level of the preceding several weeks. Chief demand is still for bars and flat rolled products, but tin plate, plates and tubular buying products are improving. Outstanding feature of the past week's business in that area was the appearance of efforts to obtain coverage beyond the next quarter's requirements. Particularly was this true with pig iron.

Buying continues at a high rate in ST. LOUIS by concerns who are preparing for new business that is expected to result from armament programs here and abroad.

Pig Iron

. . . Shipments heavier . . . Many melters have covered for third quarter

Many foundries having covered their probable requirements through at least the third quarter shipments, are increasing in total volume.

Shipments at PITTSBURGH so far this month are about 50 per cent ahead of activity a few months ago. New business is emanating from a wide miscellaneous source of consumers and there has been no abatement in the orderly placement of business. Steel makers are still putting in additional blast furnaces and Carnegie-Illinois Steel Corp. has blown in a furnace at its Edgar Thomson Works, Braddock, Pa.

With the bulk of the third quarter buying having been completed at CLEVELAND, attention now shifts to deliveries which up to June 15 were running far ahead of the corresponding May period.

Sales at CHICAGO for the third quarter have been in substantial volume and shipments of both pig iron and foundry coke so far this month are well ahead of a month ago. Producers' inventories are still high and one merchant furnace was blown out last week in order to allow this stock of iron to be depleted further.

New ordering continues light in the NEW YORK area, where most melters are covered for some months ahead. Foundries in that area are somewhat more active, although the full impact of buying for the national defense program is still to be felt. Collapse of France will affect Allied buying to a degree which cannot yet be measured. Ships at sea headed for French ports have been ordered to go to British ports.

With all important consumers covered for third quarter, new pig iron business in the SOUTHERN OHIO district was off sharply during the past week. Releases, however, against contracts were on the upgrade, melters taking their material at contract rate.

Business has been lively in ST. LOUIS, with melters making heavy commitments for third quarter requirements. Shipments, too, are increasing.

Sheets and Strip

. . . Deadline for specifications on low priced contracts postponed to July 31

Sheet and strip specifications at PITTSBURGH last week were heavier than a week ago. Mills are at a high rate of activity in an attempt to ship as much tonnage as possible by the end of this month but a carryover of some duration is now a foregone conclusion. Moderate tonnages of sheets included in recent French orders have been held up and it is expected that these specific tonnages will be cancelled.

Production of CLEVELAND continuous mills started off this week at a very high rate and was scheduled to make an additional gain in a few days. Specifications against low priced tonnages were accelerated during the past week. Following surrender of the French, a maker of trailer truck bodies ordered some of his tonnage suspended until clarification of his orders with the French. The Sharon strip mill has been active in production of 1500 tons for guard rail for the new super highway between Pittsburgh and Harrisburg.

At Chicago specifications against low priced sheet commitments are still coming in, in good volume. Some mills have extended the limit for the receipt of specifications to June 30, which was the previous deadline for shipment of the finished sheets. The new shipping limit has been postponed to the end of July. Though other mills have not yet issued formal statements such as this with reference to the deadline on sheet shipments, it is a foregone conclusion that these low priced sheets will be spread through most of July and probably extend over into August in some cases. Chicago mills have not received a great amount of automobile business recently as the 1940 buys are completed, generally speaking, and the industry seems to be proceeding slowly with purchases for 1941 models. In most Chicago sales offices it appears that virtually all of the commitments will have been specified by the end of this month. One sales office still insists that it has a little room left on its schedule whereby specifications received today can be shipped before the end of June.

Semi-Finished Steel

. . . French shell billets may go to British or U. S. Government

Semi-finished demand at PITTSBURGH has held its own in the past week and, although bookings were not as heavy as the week before, this condition is to be expected owing to the periodic placement by non-integrated mills and the routine bookings by foreign countries. There is a possibility that French steel tonnage may be taken over by the British or by the U. S. Government if cessation of warfare by France should eventually bring cancellation.

At CLEVELAND, where the French had placed orders, producers early this week were uncertain whether the British would accept delivery or whether the material would be eventually absorbed in the U. S. Government rearmament program. At any rate, production against large order backlogs continues without letup.

Considerable shell steel billets are being produced in the CHICAGO district for the French Government. Uncertainty exists at this writing as to the disposition of this material now that France has appealed for peace terms. It is certain, however, that even should all of this business be cancelled or suspended a ready market will exist both elsewhere abroad and at home.

Wire Products

. . . Orders running well ahead of a month ago

Total wire sales at PITTSBURGH so far this month range from 25 to 50 per cent ahead of a month ago, with export business a factor. Customers are specifying freely against merchant wire commitments and a pickup in manufacturers' wire demand has taken place. The capitulation of the French Government has nullified a French order for barbed wire of 5000 tons as well as an order for several thousand tons of wire rods.

New business at CHICAGO is running well ahead of a month ago. Both the industrial and merchant wire divisions are active. Cleanup releases have been received from CHICAGO manufacturers of springs for the automobile industry for

1940 cars and as yet no advice has been received as to when 1941 orders will be issued from Detroit. Demand from jobbers scattered throughout the agricultural country in the Middle West continues good and this trend is likely to be maintained for some time.

Bookings at CLEVELAND from June 1 to 15 were running well ahead of production, which was climbing. Confusion over the French surrender was not as great as in other sections of the steel industry, due to the fact that orders direct from that nation were relatively small, consisting principally of barbed wire. Production at CLEVELAND centers on manufacturers' wire and rods. Deliveries on merchant products are well maintained but new orders are quiet.

Bolts, Nuts and Rivets

. . . Production at high rate as demand increases

Production of all items continues at a high rate at CLEVELAND, assisted by recent automotive buying. Rivet makers, however, are still well below capacity operations. A feature of the market last week was the receipt of large rivet orders in heavy sizes for the new battleship *North Carolina* a day after it had been launched, which is an unusual development, as customarily these orders precede the launching. Railroad car building programs, which are being talked about, and increased shipbuilding hold promise of providing good activity over the balance of this year.

Merchant Bars

. . . Bookings are growing and deliveries are extended

Bar bookings at PITTSBURGH so far this month are still considerably larger than was booked in the same period last month. However, some of this tonnage represents French shell steel requirements upon which work was halted early in the week pending clarification. While this business may eventually be cancelled as far as the French are concerned, there is a possibility that it will be taken up by the British or by the U. S. Government.

Bookings of merchant bars in CHICAGO continue well ahead of a month ago. Chief customers are forgers, cold drawers, and manufacturers of tractors for farm and industrial uses and agricultural implements. Farm cash income since the first of the year is the highest since 1930 and a substantial increase in farm equipment sales is expected this year. Warehouses are also actively demanding hot rolled bars to keep up their stocks.

At the start of this week at CLEVELAND delivery promises were extended to five weeks. The outcome of tonnage destined for the French was the subject of conjecture. Backlogs are sufficient to cushion part of the loss of this business if it should be lost. Recent bookings include a large tonnage of flats for rail angles and considerable business from implement makers.

Reinforcing Bars

. . . Price stabilization meets with some success

The attempt at price stabilization in the concrete bar market has met with some measure of success and going prices are higher than a few weeks ago. Some mills are not much interested in taking concrete bar tonnage owing to the low prices prevailing.

Reinforcing steel awards of 19,650 tons include 6700 tons at Los Angeles for the Aliso Street viaduct and First and Glendale Boulevard grade separation; 2100 tons at Oakland, Cal., for a wharf at the Fleet supply base; 1350 tons for a section of the Chicago subway, and 1300 tons at St. Georges, Del., for the substructure of the high level bridge. Reinforcing steel inquiries of 5100 tons are all in small lots.

Plates

. . . Demand in an upward trend
. . . Railroad requirements gain

Plate demand at PITTSBURGH continues in an upward trend due to ship building, car building, export and miscellaneous requirements. Total orders booked so far this month are somewhat ahead of a month ago.

CLEVELAND reports delivery promises on heavy plate are fairly prompt, but light plates from continuous mills are extended, due to the heavy influx of sheet and strip specifications against low priced contracts. Railroad car buying holds promise of providing considerable tonnage.

Bookings in EASTERN PENNSYLVANIA continue to show improvement. Canadian buying is still active and railroad tonnages for repair work are increasing. Shipyard releases show little week-to-week variation. Several district mills received orders in the past week for finished steel for France, but due to the turn of events abroad have not yet listed this material on rolling schedules.

The Navy has taken bids on 250 buoys for delivery at Tiburon, Cal., involving about 1000 tons.

Railroad Buying

. . . Car orders increase and rail purchases are made

While no general equipment buying program, such as was carried out by the railroads last fall, has been revealed as yet, rolling stock purchases over the past few weeks have been increasing in volume.

New orders reported recently include: fifty 70-ton hopper cars for Chesapeake & Ohio from General American Transportation Co.; five 70-ton hopper cars for the Wabash Railroad from American Car & Foundry Co.; four dump cars for Phelps-Dodge Corp., from Differential Steel Car Co., Findlay, Ohio; 125 tank cars for the Union Tank Car Co., underframes already ordered, 75 tanks to be furnished

by American Car & Foundry, 25 by Struthers-Wells, 25 by Blaw-Knox Co.; fifty 70-ton hopper cars for Seaboard Airline from Pullman Standard Car Mfg. Co.; 500 hopper cars for Virginian Railway to be built in their own shops; 20 flat and 30 box cars for Panama Railroad awarded to Magor Car Co.; 50 tank cars for the U. S. Government to American Car & Foundry; 1000 box car bodies for Gulf, Mobile & Northern to American Car & Foundry Co., and 250 50-ton hopper cars for Gulf, Mobile & Northern to Pullman Standard Car Mfg. Co.; 100 70-ton hopper cars for Baltimore & Ohio to its own shops. Mobile & Ohio has ordered 1000 box cars from American Car & Foundry Co., and 250 hopper cars from Pullman Standard Car Mfg. Co., and Soo Line has ordered 500 box cars from the Pullman Standard Car Mfg. Co.

These purchases, including the bodies for Gulf, Mobile & Northern, amount to 3934 cars, as compared with the 2081 cars reported bought in the entire month of May.

In addition, New York Central has ordered steel for a car repair program and Nickel Plate Road is considering the purchase of 75 flat cars, and 500 gondolas.

Illinois Central has purchased 9000 tons of rails, distributing the tonnage as follows: 4500 tons to Tennessee Coal, Iron & Railroad Co., 2250 tons to Inland Steel Co. and 2250 tons to Carnegie-Illinois Steel Corp.

Chesapeake & Ohio is reported contemplating the purchase of its usual fall rail tonnage at an earlier date this year. From 30,000 to 50,000 tons of heavy rails are mentioned.

The same road has sent out inquiries for the following all steel equipment: 900 50-ton 40-ft. length box cars, 100 50-ton 50-ft. length box cars and 100 caboose cars.

The Pullman-Standard Car Mfg. Co. has received orders for a total of 133 trolley buses and 50 street cars. The buses will be delivered Milwaukee, Memphis, Providence, R. I., and Dayton, Ohio. Boston and the Pacific Electic Railway Co., Torrence, Cal., are purchasing the street cars. Production is getting underway at the company's Worcester, Mass., plant.

Tubular Goods

. . . Pipe demand lags behind that for some other products

Still not experiencing the substantial pick up in demand apparent in other steel markets, tubular sales at PITTSBURGH nevertheless have expanded moderately in the past 10 days. Oil country goods specifications are running ahead of a month ago and total tubular goods requirements are from 25 to 50 per cent in excess of the same period in May.

Ferroalloys

. . . Ferromanganese up $20 a ton . . . other alloys advanced

Higher manganese ore prices caused by disruption of normal trade routes by the war have brought about an increase of $20 per ton in quotations on 80 per cent ferromanganese, making the new price $120, delivered seaboard.

Spiegeleisen, electric ferrosilicon

and silico-manganese have also been advanced. The new prices were effective on June 15 on spot business and July 1 on contract business, except on 19 to 21 per cent spiegeleisen on which the new spot price was effective June 12. *New quotations are shown on page 115.*

Tin Plate

. . . Operations advance to 78% as specifications gain

Tin plate specifications continue to expand and operations this week are estimated at 78 per cent, up four points from a week ago. This operating rate represents a large output of tin plate as idle hot mills are still included in the capacity figures. Cold reducing tin plate mills are running at or above theoretical capacity.

Export Trade

. . . French appeal for peace creates temporary confusion

The news that France had appealed for peace terms created great confusion temporarily in steel export sales offices and at steel manufacturing plants, as this week's rolling schedules included a good deal of steel for the French, orders for which had been placed largely within the past few weeks.

Monday morning it was indicated that nearly all steel mills were prepared to suspend all work on these orders, but later in the day the Anglo-French Purchasing Board assured the steel mills that there would be no outright cancellations. Its statement issued to the press late on Monday said:

"Prompt and increased deliveries from the United States of America of all possible war supplies is the urgent desire of the British Purchasing Commission, for all of which the commission has ample resources."

French orders were very largely for shell steel and amounted to several hundred thousand tons. If later events should make it necessary that any of this tonnage be cancelled, it is indicated that the British will gladly take over the commitments.

While there is to be no abatement in the purchasing of steel and other war materials by the British, the demand for steel from neutral countries and particularly South America has dwindled recently. Though inquiries are numerous, orders are not as plentiful as they were earlier in the year.

In many South American countries, particularly Brazil, Uruguay and Argentina, business men are concerned over the latest events in Europe and fear that the attention of the victors may soon be turned to them.

German agents in South American countries are reported to be offering German steel for shipment by October, with a cash guarantee of delivery at prices 5 to 10 per cent below American prices.

Machine Tools

. . . SALES, INQUIRIES AND MARKET NEWS

Inquiries Boosted by Defense

New York

• • • **A large number** of inquiries are being issued by industrial firms in this area that expect to participate in the Government defense program, but few machines will be ordered until contracts are actually released by the various Government agencies. Meanwhile, buying on the part of the aircraft industry continues at the high rate of recent weeks. More business is expected to come since scarcely is one expansion program completed when another is started.

On Monday, the Anglo-French Purchasing Board indicated that no American manufacturer had been asked to stop production on a French order but that there was the possibility of the British Purchasing Commission taking over all French orders. Our own aircraft industry could also take over much of the machine tool production capacity allocated to the French for the rest of the year.

Domestic Demand Steady

Cincinnati

• • • **No diminution** in the steady demand for machinery in the Cincinnati area has been noted here last week. Manufacturers indicate that holding up of Italian commitments will not affect the market, since machines scheduled for Italian use may be diverted to other sources. Reports of Government embargo on Russian and Japanese shipments were denied by local manufacturers, most of who are making their regular shipments to these countries.

Domestic demand is on the upgrade, with broad inquiries from Governmental agencies, largely for the rearmament program.

No Frantic Buying So Far

Chicago

• • • **Machine tools** are being ordered at Chicago at a rate higher than that of a month ago. Chicago machine tool dealers report that of the business now being booked there is little that can be directly traced to the armament program, either for this country or for the Allies. Rock Island Arsenal has yet to release inquiries on the 1941 budget, starting July 1. Numerous inquiries for machinery for machining shells have been issued in this district but as yet little has been ordered. The Government has not yet formerly requisitioned any machine tools destined for other consumers as far as is known, but it is believed that such action may come in the near future.

French Defeat Not Vital

Cleveland

• • • **Outside of some** temporary confusion over immediate procedure, the effect of the French surrender upon the machine tool industry will be negligible, according to producers here Monday. Machines will be diverted to the United States rearmament program, which now appears likely to get under way more quickly than seemed possible late last week, and to the British, who were calling from Canada and New York Monday, indicating if possible, they would take over a good share of the machine tools the French placed on order in this country. Production is expected to continue unabated. Very little difficulty will be encountered in changing universal machines over for use in this country.

No cancellations of orders had been received here Monday from the French Commission.

Non-Ferrous Metals

. . . MARKET ACTIVITIES AND PRICE TRENDS

New York, June 18—The market here continues to take its cue from Europe. All during the past week domestic buying continued at a steady pace, drying up practically all the nearby metal available and covering all the copper that sellers expect to have available up to September. On Monday, however, news of the French request for an armistice put a damper on the bullishness and sales dropped to occasional carlot business. This respite from the heavy buying pressure of the past three weeks was not unwelcomed by the sellers.

Copper sales in the past week totaled about 12,000 tons, making the total for the month through Saturday 88,200 tons, as compared with 38,000 in the comparable period of May. Red metal was available in the outside market yesterday at 11.50c. per lb., Connecticut Valley, whereas little was obtainable last week at 11.625c., with as high as 11.70c. reported having been done. First hand sellers remained at 11.50c. all during the week.

Apparently the British are taking over the French contract for 75,000 tons reported here two weeks ago. This metal was to be shipped at the rate of 25,000 tons in June, July and August. Only a part of the June lot had been shipped up to the past week.

The progressive elimination of customers from the export market has reduced activity there to a very low level. At present only important customer remaining is Great Britain, Italy having suspended shipments just before declaring war. While Japan has been an important buyer in the past, it is doubtful if this source will assume much importance in the future in view of recent developments in the Far East.

Zinc

Sales volume dropped sharply in the past week to 5033 tons of prime Western metal from 12,280 tons in the previous week. This decline partly reflects restrictions on sales put into effect by several sellers. Such business as has been booked in the past week was generally on an average price basis, most sellers declining to accept new orders on a flat price basis. The heavy buying of the past several weeks has provided customers with adequate coverage for some time to come and the present quiet will likely have no weakening effect on prices.

Lead

Moderately active demand persisted all during the past week, but the period's total sales were not as heavy in the preceding week. All of June and over 90 per cent of July requirements have already been covered by consumers. Shipments continue to expand with all indications pointing to a further rise in deliveries this month and a decrease in stocks. Fear that higher domestic prices would encourage importations has undoubtedly been a factor in preventing sharp price increases. Quotations here remain unchanged at 4.85c. per lb., St. Louis.

Tin

Consumer demand continued in heavy volume all during the past week, with tin plate makers especially active, and prices rose to a high of 58c. on Friday. News of the French defection on Monday caused a sharp break in the East and London and was reflected here in a drop of 3½c. in the price of straits. Pending some clarification of the French situation, both buyers and sellers have taken positions on the sidelines and sales yesterday and today were extremely small.

Non-Ferrous Metal Prices on Page 111

Scrap . . . MARKET ACTIVITIES AND QUOTATION TRENDS

• • • **Despite uncertainties** introduced into the market by the appeal for peace by the French on Monday, scrap markets continue strong all over the country. Sales made at Cleveland last week established No. 1 steel $1.50 above the level of the preceding week. Youngstown prices advanced $1 for the third week and No. 1 at $22 is $1 higher there than at Pittsburgh, tending to draw material out of that district. No. 1 is up 50c. at Pittsburgh and the average has advanced 75c. at Philadelphia, based on mill sales and broker transactions. There has been no recent mill sale at Chicago, but strength is apparent in bids on railroad lists and broker-dealer transactions, warranting an advance of $1 in the steel melting grades. Biggest transaction reported is the purchase of 50,000 tons of scrap by the principal Buffalo consumer, at a price $1 higher than the previous sale. Dealer buying prices are higher all over the country.

The composite price moved up 75c. this week to $19.92, the highest level reached since Nov. 14, 1939. The average price of No. 1 steel has gained exactly $2 in four weeks.

Pittsburgh

Despite the appeal for peace by the French, which has momentarily caused some confusion in the market, the undertone remains exceptionally strong and supplies at current prices are far from plentiful. On the basis of broker buying and sales into consumption, No. 1 heavy melting is up 50c. this week, being quotable at $20.50 to $21. No. 2 heavy melting has been sold in this district in the past week at $20 a ton. Specialties are strong and supplies are not plentiful. Prices here are now to be considered nominal, pending other sales.

Chicago

Though the last reported mill sale was made at $18 a gross ton delivered, brokers are now paying for No. 1 steel a minimum of $19 a gross ton and some have paid 50c. higher. As further indications of the strength of this market, a railroad last week was offered over $19.60 gross for No. 1 steel and turned the offer down and a local transit line withdrew its offering of 8000 tons of No. 1 and other grades of steel scrap, though very good prices were bid. Two more railroad lists, the Rock Island and the Santa Fe, will be out for bids this week. Cast grades are unusually strong, a scarcity in Michigan, Wisconsin and Ohio pulling some of this material out of this district and creating a temporary shortage here. In line with broker-dealer transactions only, No. 1 steel at Chicago is nominally quoted this week at $18.50 to $19, with other steel grades rising in proportion.

Philadelphia

Despite the confusing elements entering the picture, the market here continues strong, with prices moving into still higher ground. Some interests feel that the present market is very close to the peak and future increases, if any, will be much slower than in the past. At present the only active export buyer left in this district is England. Another boat for this country, the third so far this month, is expected on the 25th, to take on 3000 tons of scrap and some new steel.

Cleveland

The higher quotations reflect latest sales. At the start of this week, however, the market appeared likely to be entering a period of nominal prices. The sudden turn of European events served to make scrap freer here. Another small boatload of scrap from Providence, R. I., arrived last week.

Youngstown

Sales late last week established No. 1 steel here at $22 per ton, which is reflected in this week's published quotations. The market appeared to be entering a period of watchful waiting at the start of this week. However, scrap was coming out much more freely, according to mill buyers.

Buffalo

One of the largest sales ever made in this district features the market this week. The principal district consumer purchased 50,000 tons of material at figures which place the value of No. 1 heavy melting steel at $19.50 to $20. This price constitutes a $1 advance over previous sales, and values all along the list are moved up, with the exception of cast grades, which are slack.

St. Louis

Strong undertone prevails in market for scrap iron and steel. Offerings are light and sellers are disposed to hold firmly to the stocks on hand. They are meeting strong resistance from the mills and as a result trading has been confined to a few small scattered tonnages. Little country scrap is being laid down in commercial yards. Railroad lists: Mobile & Ohio, 11,324 tons; Chicago, Rock Island and Pacific, 2614 tons, and Southern Railroad, 4684 tons.

Detroit

Sales of 205 cars of automotive hydraulic compressed sheets on Monday at a price somewhere above $18 has paced the Detroit market upward. There has been a crystallization of sentiment on prices, eliminating the former spread of $1 which had been reported on most items, and this week there is a further upward movement, although more moderate than that encountered in recent weeks.

New York

Considerable material is being shipped to eastern Pennsylvania points, and dealer buying prices for scrap on cars are higher in keeping with the advance in the Philadelphia market. Nearly every cargo of steel leaving this port for Great Britain includes some scrap. There is much speculation as to what the Japanese will do, but for the present both buyers and sellers are sitting tight. Export buying prices are unchanged.

Cincinnati

The war news during the past week added a note of uncertainty to the local scrap market. However, dealers are bidding actively for available material and district mills continue to accept scrap on contract. One or two small orders for fill-ins were reported. Bids are up 50c on the whole list, but these prices are not attracting material into the market in large quantities.

Birmingham

The price of No. 1 cast advanced to $17, this being the only change in the market here for the past fortnight. It is the current opinion that while there is ample scrap available for all demand, movements are slow. Sellers are apparently waiting to see what will occur and are expecting a better market within a short time. At the yards inventories are substantial and buyers will not find any difficulty in obtaining their requirements when they return to active buying.

Boston

Prices are generally 50c to $1 a ton higher than a week ago. For Pittsburgh delivery brokers are paying $7.90 a ton on cars for steel turnings, while for eastern Pennsylvania delivery alloy-free turnings run as high as $8.25 a ton. Bundled skeleton for Pittsburgh sells around $10.40 a ton on cars and for eastern Pennsylvania at $12 to $12.25. Blast furnace material for eastern Pennsylvania averages $6.50 to $7.50 a ton on cars, with lowest recent price $6.40, but for Buffalo delivery $8 has been paid. Foundries are taking textile and machinery cast a little more freely at $17 to $18 a ton delivered nearby points, with more recent foundry offers at $19. Export prices are firm but unchanged despite curtailment of markets.

Toronto

Keen activity on the part of consumers and dealers features Canadian iron and steel scrap markets. Prices are firm, with indication of early advances. Dealers state there is considerable interest in forward delivery commitments.

IRON AND STEEL SCRAP PRICES

PITTSBURGH

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	$20.50 to $21.00
Railroad heavy mltng.	21.50 to 22.00
No. 2 heavy melting..	19.50 to 20.00
Railroad scrap rails...	21.50 to 22.00
Rails 3 ft. and under..	25.00 to 25.50
Comp. sheet steel.....	20.50 to 21.00
Hand bundled sheets..	19.50 to 20.00
Heavy steel axle turn.	19.50 to 20.00
Machine shop turnings	14.50 to 15.00
Short shov. turnings..	16.00 to 16.50
Mixed bor. & turn.....	11.50 to 12.00
Cast iron borings	11.50 to 12.00
Cast iron carwheels...	20.50 to 21.00
Heavy breakable cast.	17.00 to 17.50
No. 1 cupola cast.....	20.50 to 21.00
RR. knuckles & coup..	25.50 to 26.00
Rail coil springs	25.50 to 26.00
Rail leaf springs	25.50 to 26.00
Rolled steel wheels....	25.50 to 26.00
Low phos. billet crops.	25.00 to 26.00
Low phos. punching...	24.50 to 25.00
Low phos. heavy plate.	23.50 to 24.00
Railroad malleable ...	23.50 to 24.00

PHILADELPHIA

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	$20.00 to $20.50
No. 2 hvy. mltng. steel.	19.00
Hydraulic bund., new..	20.00 to 20.50
Hydraulic bund., old..	16.50 to 17.00
Steel rails for rolling..	22.00 to 22.50
Cast iron carwheels...	22.50 to 23.00
Hvy. breakable cast...	21.00
No. 1 cupola cast	22.00 to 22.50
Mixed yard (f'd'y) cast	19.00 to 19.50
tSove plate (steel wks.)	17.50 to 18.00
Railroad malleable ...	23.00 to 23.50
Machine shop turn....	13.00 to 13.50
No. 1 blast furnace....	12.00
Cast borings	12.00
Heavy axle turnings..	17.00 to 17.50
No. 1 low phos. hvy...	24.00 to 24.50
Couplers & knuckles..	24.00 to 24.50
Rolled steel wheels....	24.00 to 24.50
Steel axles	23.00 to 23.50
Shafting	24.50 to 25.00
Spec. iron & steel pipe	17.00 to 17.50
Cast borings (chem.).. 14.00 to 14.50	

CHICAGO

Delivered to Chicago district consumers:

	Per Gross Ton
Hvy. mltng. steel	$18.50 to $19.00
Auto. hvy. mltng. steel alloy free	17.50 to 18.00
No. 2 auto steel.....	15.25 to 15.75
Shoveling steel	18.50 to 19.00
Factory bundles	18.00 to 18.50
Dealers' bundles	16.50 to 17.00
No. 1 busheling	17.50 to 18.00
No. 2 busheling, old...	8.00 to 8.50
Rolled carwheels	20.50 to 21.00
Railroad tires, cut	21.00 to 21.50
Railroad leaf springs..	19.00 to 19.50
Steel coup. & knuckles.	21.00 to 21.50
Axle turnings	17.75 to 18.25
Coil springs	22.00 to 22.50
Axle turn. (elec.)	18.75 to 19.25
Low phos. punchings..	20.00 to 20.50
Low phos. plates 12 in. and under	20.50 to 21.00
Cast iron borings.....	11.25 to 11.75
Short shov. turn.	12.50 to 13.00
Machine shop turn.....	12.50 to 13.00
Rerolling rails	23.00 to 23.50
Steel rails under 3 ft..	19.75 to 20.25
Steel rails under 2 ft..	22.00 to 22.50
Angle bars steel	20.00 to 20.50
Cast iron carwheels...	18.75 to 19.25
Railroad malleable	22.50 to 23.00
Agric. malleable	14.75 to 15.25
	Per Net Ton
Iron car axles	23.50 to 24.00
Steel car axles	22.50 to 23.00
Locomotive tires	15.00 to 15.50
Pipes and flues	11.50 to 12.00
No. 1 machinery cast..	17.00 to 17.50
Clean auto. blocks....	18.00 to 18.50
No. 1 railroad cast.....	15.00 to 15.50
No. 1 agric. cast.....	13.50 to 14.00
Stove plate	12.00 to 12.50
Grate bars	12.50 to 13.00
Brake shoes	13.00 to 13.50

YOUNGSTOWN

Per gross ton delivered to consumer:

No. 1 hvy. mltng steel	$21.50 to $22.00
No. 2 hvy. mltng. steel.	20.50 to 21.00
Low phos. plate	22.50 to 23.00
No. 1 busheling	20.25 to 20.75
Hydraulic bundles	21.00 to 21.50
Machine shop turn.....	14.00 to 14.50

CLEVELAND

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	$20.50 to $21.00
No. 2 hvy. mltng. steel.	19.50 to 20.00
Comp. sheet steel	$20.00 to $20.50
Light bund. stampings	16.50 to 17.00
Drop forge flashings...	19.25 to 19.75
Machine shop turn....	13.50 to 14.00
Short shov. turn.....	14.00 to 14.50
No. 1 busheling	20.00 to 20.50
Steel axle turnings....	19.25 to 19.75
Low phos. billet and bloom crops	25.50 to 26.00
Cast iron borings.....	13.50 to 14.00
Mixed bor. & turn.....	13.50 to 14.00
No. 2 busheling	13.50 to 14.00
No. 1 cupola cast.....	22.50 to 23.00
Railroad grate bars...	15.50 to 16.00
Stove plate	15.50 to 16.00
Rails under 3 ft.	25.50 to 26.00
Rails for rolling	24.50 to 25.00
Railroad malleable	23.50 to 24.00

BUFFALO

Per gross ton delivered to consumer:

No. 1 hvy. mltng. steel	$19.50 to $20.00
No. 2 hvy. mltng. steel.	17.50 to 18.00
Scrap rails	22.50 to 23.00
New hvy. b'ndled sheets.	17.50 to 18.00
Old hydraul. bundles..	15.50 to 16.00
Drop forge flashings..	17.50 to 18.00
No. 1 busheling	17.50 to 18.00
Machine shop turn....	11.50 to 12.50
Shov. turnings	13.00 to 13.50
Mixed bor. & turn.....	11.50 to 12.00
Cast iron borings	11.50 to 12.00
Knuckles & couplers..	23.00 to 24.00
Coil & leaf springs....	23.00 to 24.00
Rolled steel wheels....	23.00 to 24.00
No. 1 machinery cast.	20.00 to 20.50
No. 1 cupola cast	18.50 to 19.00
Stove plate	16.00 to 16.50
Steel rails under 3 ft...	23.50 to 24.00
Cast iron carwheels...	18.50 to 20.00
Railroad malleable	23.00 to 23.50

ST. LOUIS

Dealers' buying prices per gross ton delivered to consumer:

Selected hvy. melting.	$16.50 to $17.00
No. 1 hvy. melting....	16.25 to 16.75
No. 2 hvy. melting....	15.25 to 15.75
No. 1 locomotive tires.	19.00 to 19.50
Misc. stand. sec. rails..	20.00 to 20.50
Railroad springs	20.00 to 20.50
Bundled sheets	12.00 to 12.50
Cast bor. & turn.....	7.00 to 7.50
Machine shop turn....	9.00 to 9.50
Heavy turnings	12.00 to 12.50
Rails for rolling	21.00 to 21.50
Steel car axles	21.00 to 21.50
No. 1 RR. wrought....	14.00 to 14.50
No. 2 RR. wrought....	15.50 to 16.00
Steel rails under 3 ft...	21.50 to 22.00
Steel angle bars	18.50 to 19.00
Cast iron carwheels...	17.50 to 18.00
No. 1 machinery cast..	19.00 to 19.50
Railroad malleable ...	19.00 to 19.50
Breakable cast	19.50 to 20.00
Stove plate	16.50 to 17.00
Grate bars	13.50 to 14.00
Brake shoes	14.00 to 14.50

CINCINNATI

Dealers' buying prices per gross ton at yards:

No. 1 hvy. mltng. steel.	$15.50 to $16.00
No. 2 hvy. mltng. steel.	14.00 to 14.50
Scrap rails for mltng..	21.00 to 21.50
Loose sheet clippings..	10.25 to 10.75
Hydrau. b'ndled sheets	14.75 to 15.25
Cast iron borings	7.00 to 7.50
Machine shop turn....	8.00 to 8.50
No. 1 busheling	11.50 to 12.00
No. 2 busheling	5.75 to 6.25
Rails for rolling	22.50 to 23.00
No. 1 locomotive tires.	17.00 to 17.50
Short rails	23.00 to 23.50
Cast iron carwheels...	17.00 to 17.50
No. 1 machinery cast..	19.50 to 20.00
No. 1 railroad cast....	18.00 to 18.50
Burnt cast	11.50 to 12.00
Stove plates	11.50 to 12.00
Agricul. malleable	16.00 to 16.50
Railroad malleable ...	19.00 to 19.50
Mixed hvy. cast	16.75 to 17.25

BIRMINGHAM

Per gross ton delivered to consumer:

No. 1 hvy. melting steel	$16.00
No. 2 hvy. melting steel	15.00
No. 1 busheling	14.00
Scrap steel rails	15.00
Steel rails under 3 ft...	16.00
Rails for rolling	16.50
Long turnings	5.00
Cast iron borings	7.50
Stove plate	10.00
Steel axles	18.00
No. 1 RR wrought....	14.00
No. 1 cast	17.00
No. 2 cast	12.50
Cast iron carwheels...	13.00
Steel car wheels	16.00

DETROIT

Dealers' buying prices per gross ton, f.o.b. cars:

No. 1 heavy melting...	$17.00 to $17.50
No. 2 heavy melting...	16.00 to 16.50
Borings and turnings..	11.00 to 11.50
Long turnings	11.00 to 11.50
Short shov. turnings..	11.50 to 12.00
No. 1 cast	20.00 to 20.50
Automotive cast	20.00 to 20.50
Hvy. breakable cast...	17.00 to 17.50
Stove plate	13.00 to 13.50
Hydraul. Comp. sheets	18.00 to 18.50
New busheling	16.50 to 17.00
Sheet clips	14.50 to 15.00
Flashings	16.00 to 16.50
Low phos. plate	18.50 to 19.00

NEW YORK

Dealers' buying prices per gross ton on cars:

No. 1 hvy. mltng. steel.	$15.50 to $16.00
No. 2 hvy. mltng. steel.	14.50 to 15.00
Hvy. breakable cast...	16.50 to 17.00
No. 1 machinery cast.	18.50 to 19.00
No. 2 cast	15.00 to 15.50
Stove plate	12.50 to 13.00
Steel car axles	20.00 to 20.50
Shafting	20.00 to 20.50
No. 1 RR. wrought....	14.50 to 15.50
No. 1 wrought long....	13.00 to 13.50
Spec. iron & steel pipe	12.00 to 12.50
Rails for rolling	16.50 to 17.50
Clean steel turnings*..	8.50 to 9.00
Cast borings*	8.50 to 9.00
No. 1 blast furnace....	8.50 to 9.00
Cast borings (chem.)..	10.00 to 11.00
Unprepared yard scrap	9.00 to 9.50
Light iron	7.00 to 7.50
Per gross ton delivered local foundries:	
No. 1 machin. cast....	$19.00 to $20.00
No. 2 cast	18.00 to 18.50

* $1.50 less for truck loads.

BOSTON

Dealers' buying prices per gross ton:

Breakable cast	$15.15
Machine shop turn.....	$7.90 to 8.25
Mixed bor. & turn....	6.50 to 8.00
Bun. skeleton long.....	12.00 to 12.25
Shafting	19.00 to 19.25
Stove plate	11.65
Cast bor. chemical	9.00 to 9.25
Per gross ton delivered consumers' yards:	
Textile cast	$17.00 to $19.60
No. 1 machine cast....	17.00 to 19.00
Per gross ton delivered dealers' yards:	
No. 1 hvy. mltng. steel.	$14.25 to $14.50
No. 2 steel	13.25 to 13.50

PACIFIC COAST

Per net ton delivered to consumer:

	San Fran.	Los Ang.	Seattle
No. 1 hvy. mltng. steel	$12.00	$12.00	$11.00
No. 2 hvy. mltng. steel	11.00	11.00	10.00
Bundles	10.00	10.00	9.00

CANADA

Dealers' buying prices at these yards, per gross ton:

	Toronto	Montreal
Low phos. steel.....	$11.50	$11.00
No. 1 hvy. mltng. steel.	11.25	10.75
No. 2 hvy. mltng. steel.	10.00	9.50
Mixed dealers steel...	8.75	8.25
Drop forge flashings...	9.75	9.25
New loose clippings...	8.75	8.25
Busheling	6.00	5.50
Scrap pipe	7.75	7.25
Steel turnings	7.25	6.75
Cast borings	6.75	6.25
Machinery cast	20.00	19.00
Dealers' cast	19.00	18.00
Stove plate	14.00	13.00

EXPORT

Dealers' buying prices per gross ton:

New York, truck lots, delivered, barges	
No. 1 hvy. mltng. steel.....	$15.50
No. 2 hvy. mltng. steel.....	13.50
No. 2 cast	14.00
Stove plate	12.00
Boston on cars at Army Base or Mystic Wharf	
No. 1 hvy. mltng. steel.	$15.50 to $15.75
No. 2 hvy. mltng. steel.	14.00 to 14.25
Rail (scrap)	15.50 to 16.00
Stove plate	12.00 to 12.25
Philadelphia, delivered alongside boats, Port Richmond	
No. 1 hvy. mltng. steel.....	$19.25
No. 2 hvy. mltng. steel.....	18.50

Construction Steel

. . .STRUCTURAL STEEL, REINFORCING BARS, PLATES, PILING, ETC.

Fabricated Steel

Lettings in fair volume at 18,850 tons; new projects of 29,400 tons are slightly higher than those of a week ago.

AWARDS

NORTH ATLANTIC STATES

5700 Tons, Syracuse, N. Y., grade crossing elimination, Delaware, Lackawanna & Western Railroad Co., to American Bridge Co., Pittsburgh.

3775 Tons, Deer Park, Long Island, N. Y., infirmary building, to American Bridge Co., Pittsburgh.

1000 Tons, W. Reading, Pa., power plant addition for Metropolitan Edison Co., to Bethlehem Steel Co., Bethlehem, Pa.

900 Tons, Brockway, Pa., buildings for Brockway Glass Co., to Guibert Steel Co., Pittsburgh.

475 Tons, Worcester, Mass., office building for Heald Machine Co., to Bethlehem Steel Co., Bethlehem, Pa.

380 Tons, Atlantic City, N. J., power house extension for Atlantic City Electric Co., to an unnamed bidder.

360 Tons, Chemung County, N. Y., State highway bridge, FAS-RC-4036, to Lackawanna Steel Construction Corp., Buffalo.

275 Tons, Vienna, Md., power plant addition for Delmarva Power Co., to Belmont Iron Works, Philadelphia.

250 Tons, Lock Haven, Pa., mill buildings for Piper Aircraft Corp., to Pittsburgh Bridge & Iron Co., Pittsburgh.

215 Tons, Fall River, Mass., telephone exchange building, to Bethlehem Fabricators, Inc., Bethlehem, Pa.

190 Tons, State College, Pa., high school addition to Weatherly Steel Co., Weatherly, Pa.

180 Tons, Buffalo, building for Worthington Pump Co., to Austin Co., Cleveland.

155 Tons, East Pittsburgh, Pa., Westinghouse Electric & Mfg. Co. receiving building, to Keystone Engineering Co.

150 Tons, Beverly, Mass., hospital buildings, to Bethlehem Steel Co., Bethlehem, Pa.

150 Tons, Hornell, N. Y., Bennett Street bridge, to Lackawanna Steel Construction Corp., Buffalo.

130 Tons, Pittsburgh, Pittsburgh Press garage, to Pittsburgh Bridge & Iron Works, Pittsburgh.

115 Tons, Allegheny County, Pa., bridge, to Fort Pitt Bridge Works Co., Pittsburgh.

115 Tons, Sharon, Pa., salvage building for Westinghouse Electric Mfg. Co., to Pittsburgh Bridge & Iron Co., Pittsburgh.

100 Tons, Petersham, Mass., Shaler Hall and Fisher Museum, to Haarman Steel Co., Holyoke, Mass.

THE SOUTH

235 Tons, Heard County, Ga., bridge FAP-479-E (1), to Vincennes Steel Corp., Vincennes, Ind.

CENTRAL STATES

750 Tons, Detroit, factory addition for General Motors diesel engineering division, to R. C. Mahon, Detroit.

575 Tons, Detroit, State bridge X-4 of 82-22-4, to Bethlehem Steel Co., Bethlehem, Pa.

490 Tons, Mansfield, Ohio, Westinghouse Electric & Mfg. Co. factory building, to Ingalls Iron Works Co., Birmingham.

345 Tons, Coffey County, Kan., bridge 32.0, to Kansas City Structural Steel Co., Kansas City, Kan.

260 Tons, St. Marys, Ohio, novelty building for Goodyear Tire & Rubber Co., to Burger Iron Co., Akron, Ohio.

315 Tons, Rock Island, Ill., guide walls for Mississippi River locks 16, 18, 20 and 21, to Mississippi Valley Structural Steel Co., Decatur, Ill., through United Construction Co., Winona, Minn., was erroneously reported in June 6 issue as awarded to Duffin Iron Co., Chicago.

215 Tons, Ord, Neb., bridge FAP-322E (1), to American Bridge Co., Pittsburgh.

145 Tons, Green Bay, Wis., Mason Street bridge, to Milwaukee Bridge Co., Milwaukee.

135 Tons, Blackhawk County, Iowa, I-beam spans, to Pittsburgh-Des Moines Steel Co., Des Moines, Iowa.

111 Tons, Reading, Ohio, warehouse, to Bethlehem Steel Co., Bethlehem, Pa.

110 Tons, Cincinnati, building for Drackett Chemical Co., to Bethlehem Steel Co., Bethlehem, Pa.

110 Tons, Marion, Ohio, power station, for Marion-Reserve Power Co., to Pittsburgh Bridge & Iron Co., Pittsburgh.

WESTERN STATES

375 Tons, Oakland, Cal., Fruitvale telephone building, to Bethlehem Steel Co., San Francisco.

360 Tons, Earp, Cal., Bureau of Reclamation, Specification 1354-D, Parker Dam, to American Bridge Co., Pittsburgh.

PENDING STRUCTURAL PROJECTS

NORTH ATLANTIC STATES

11,000 Tons, Rockaway, N. Y., grade eliminations, contract No. 4, Long Island Railroad Co.

2000 Tons, New York, Benjamin Franklin High School.

1100 Tons, Reading, Pa., round wire mill for Carpenter Steel Co.

300 Tons, Aberdeen Proving Ground, Md., Army shop building and ordnance school.

190 Tons, New York, school building for St. Gabriel's Roman Catholic Church.

125 Tons, Philadelphia, reinforcing bridge No. 11/46 for Central Railroad Co. of New Jersey.

105 Tons, Washington, building extension No. 159, Navy Yard, for U. S. Bureau of Yards and Docks.

100 Tons, Butler County, Pa., State highway project R-73, section R-3. Baldwin Brothers, Cleveland, low bidder on general contract.

THE SOUTH

440 Tons, Cocoa, Fla., Indian River State Bridge.

300 Tons, Memphis, Tenn., including several hundred tons of corrugated sheets, buildings for Tennessee Powder Co.

225 Tons, Southard, Okla., hydrocal plant for U. S. Gypsum Co.

115 Tons, Arlington County, Va., overpass, National Airport, for Government.

CENTRAL STATES

550 Tons, Detroit, building additions for Michigan Bell Telephone Co.

540 Tons, Willoughby, Ohio, warehouse addition for Ohio Rubber Co.

428 Tons, St. Louis, bridge under Wabash Railroad, Missouri highway project; bids June 28.

425 Tons, Chicago, three bridges in Lincoln Park; bids July 2.

275 Tons, Lansing, Mich., Oldsmobile Division factory building for General Motors Corp.

145 Tons, Marine City, Mich., factory addition for Detroit Gasket & Mfg. Co.

130 Tons, Rawson, Wis., railroad bridge No. 373.

120 Tons, Cleveland, office building for Arthur G. McKee & Co.

110 Tons, Calamine, Wis., State bridge.

105 Tons, Middletown, Ohio, office building for Ohio Bell Telephone Co.

100 Tons, Massillon, Ohio, mill building, for Republic Steel Corp.

WESTERN STATES

4500 Tons, Ogden, Utah, Government depot supply building, Hill Field.

1816 Tons, Caddoa, Colo., Caddoa Dam; bids July 12; includes semi- and cast steel.

1400 Tons, San Francisco, bottle house for Acme Brewery Co.

350 Tons, Vancouver, Wash., buildings No. 58 and 60, for Aluminum Co. of America.

350 Tons, State of Colorado, two bridges; bids by State Highway Commission, Denver, June 25.

225 Tons, Minturn, Colo., overpass on State highways 78 and 4; bids June 25.

200 Tons, Redding, Cal., trestle.

160 Tons, Casper, Wyo., underpass; bids June 25.

128 Tons, Morrison, Colo., State highway 74 improvements; bids June 25.

100 Tons, Tacoma, Wash., Hylebos Waterway crossing towers; Bethlehem Steel Co., low bidder.

100 Tons, Yakima, Wash., bridge and flume over wasteway No. 2, Specification 1374-D, for Bureau of Reclamation.

Weekly Bookings of Construction Steel

Week Ended ——→	June 18, 1940	June 11, 1940	May 21, 1940	June 20, 1939	Year to Date 1940	Year to Date 1939
Fabricated structural steel awards	18,850	17,550	10,620	23,300	363,680	476,825
Fabricated plate awards	0	1,345	1,910	1,275	69,385	90,655
Steel sheet piling awards	2,100	0	0	4,050	18,640	30,555
Reinforcing bar awards	19,650	6,700	13,150	8,000	210,400	226,345
Total Letting of Construction Steel	40,600	25,595	25,680	36,625	662,105	824,380

FABRICATED PLATES

PENDING PROJECTS

1000 **Tons,** Tiburon, Cal., buoys for Navy (Schedules 1706 and 1757); bids in.

SHEET PILING

AWARDS

1700 **Tons,** Rock Island, Ill., Mississippi River Locks Nos. 16, 18, 20 and 21, to Inland Steel Co., Chicago, through United Construction Co., Chicago.

400 **Tons,** Rock Island, Ill., Mississippi River Lock No. 11, to Carnegie-Illinois Steel Corp., Chicago, through J. C. McCarthy Co., Davenport, Iowa.

PENDING PROJECTS

500 **Tons,** Kansas City, Kan., flood wall protection; bids June 26 at office of U. S. Engineers, Kansas City, Mo.

Reinforcing Steel

Awards of 19,650 tons; 5100 tons in new projects

AWARDS

ATLANTIC STATES

1300 **Tons,** St. Georges, Del., substructure, high level bridge, to Bethlehem Steel Co., Bethlehem, Pa., through Penker Construction Co., contractor.

600 **Tons,** Relay, Md., plant for Calvert Distilling Co., to Bethlehem Steel Co., Bethlehem, Pa., through Consolidated Engineering Co.

400 **Tons,** Pittsburgh, Duquesne Light Co. plant, to Jones & Laughlin Steel Corp., Pittsburgh.

300 **Tons,** Newark, N. J., Wright Aeronautical Corp. work, to Truscon Steel Co., Youngstown.

260 **Tons,** Philadelphia Navy Yard, way No. 3, to Concrete Steel Co., New York.

180 **Tons,** Washington, Weather Bureau building, to Bethlehem Steel Co., Bethlehem, Pa., through Thorp-Rosoff Co.

150 **Tons,** Chicopee, Mass., two Government warehouses, to an unnamed bidder; Grande & Volpe, Inc., Malden, Mass., contractor.

100 **Tons,** Chicopee, Mass., Jones Ferry pumping station, to Bethlehem Steel Co., Bethlehem, Pa.; Ley Construction Co., Springfield, Mass., contractor.

100 **Tons,** Rennselaer, N. Y., factory No. 22 for Bayer Co., to Bethlehem Steel Co., Bethlehem, Pa.

SOUTH AND CENTRAL

1350 **Tons,** Chicago, section S1A subway, to Inland Steel Co., Chicago, through Paschen Brothers Construction Co., Chicago.

950 **Tons,** Rock Island, Ill., Mississippi River guide wall, Locks 16, 18, 20 and 21, to Inland Steel Co., Chicago, through United Construction Co., Winona, Minn.

400 **Tons,** Detroit, Parkside housing project, to Truscon Steel Co., Youngstown, through Bryant & Detwiler.

232 **Tons,** Hickman-Foulton County, Ky., highway project FAS-329, to Laclede Steel Co., St. Louis; N. E. Stone, contractor.

170 **Tons,** Owen County, Ky., highway project SP-94-233, to Pollak Steel Co., Cincinnati, through Highland Co., contractor.

150 **Tons,** Cleveland, Moreland Boulevard apartments, to Patterson-Leitch Co., Cleveland.

150 **Tons,** Indianapolis, building for Standard Grocery Co., to Laclede Steel Co., St. Louis.

130 **Tons,** Chicago, Illinois Bell Telephone building, to Inland Steel Co., Chicago.

WESTERN STATES

6700 **Tons,** Los Angeles, Aliso Street viaduct and First and Glendale Boulevard grade separation, to Blue Diamond Corp., Los Angeles.

2150 **Tons,** Oakland, Cal., marginal wharf at fleet supply base (Specifications 9587), to Soule Steel Co., San Francisco, through M. H. Golden, San Francisco, contractor.

685 **Tons,** Ogden, Utah, runway fabric for Hill Field, to Colorado Fuel & Iron Corp., Denver.

548 **Tons,** Los Angeles, Cahuenga Boulevard bridge, to Ceco Steel Products Co., Los Angeles, through Radich & Brown, Los Angeles, contractor.

520 **Tons,** Odair, Wash., Grand Coulee power plant (Invitation B-38273-A), to Bethlehem Steel Co., San Francisco.

500 **Tons,** Burbank, Cal., hot rolled rods for Glendale-Burbank distribution line of Metropolitan Water District of Los Angeles, to Bethlehem Steel Co., Los Angeles, through American Concrete & Steel Pipe Co., Los Angeles, contractor.

265 **Tons,** Banning, Cal., State highway work, to Ceco Steel Products Co., Los Angeles, through George Herz & Co., San Bernardino, Cal., contractors.

242 **Tons,** Los Angeles, Angeles Crest highway bridges, to Ceco Steel Products Co., Los Angeles, through Person & Hollingsworth, Los Angeles, contractors.

240 **Tons,** Los Angeles, Pacific Old Peoples Home, to Security Materials Co., Los Angeles, through H. F. Hendrickson, Los Angeles, contractor.

220 **Tons,** Odair, Wash., Grand Coulee Dam (Invitation B-38319-A), to Bethlehem Steel Co.

210 **Tons,** Los Angeles, Avenue 40 bridge, Arroyo Seco Parkway project, to Blue Diamond Corp., Los Angeles, through J. E. Haddock, Pasadena, Cal., contractor.

115 **Tons,** Kremmling, Colo., Colorado-Big Thompson project (Invitation B-46246-A), to Colorado Fuel & Iron Corp., Denver.

100 **Tons,** Newark, Cal., Leslie Salt Co. plant, to Bethlehem Steel Co., San Francisco, through Cahill Brothers, San Francisco, contractors.

HAWAII

200 **Tons,** Hickam Field, T. H., hospital, to Honolulu Iron Works, Honolulu, through W. S. Ching, Honolulu, contractor.

PENDING REINFORCING STEEL PROJECTS

ATLANTIC STATES

200 **Tons,** New Britain, Conn., Mount Pleasant housing project.

SOUTH AND CENTRAL

500 **Tons,** Albia, Iowa, Procurement invitation, Treasury Department.

465 **Tons,** Chicago, section S-9-B, subway.

400 **Tons,** Cook County, Ill., Milwaukee Road bridge, Franklin Park.

300 **Tons,** Blackhawk County, Iowa, State highway project.

300 **Tons,** Kansas City, Kan., flood walls; bids June 26 at office of U. S. Engineers, Kansas City, Mo.

285 **Tons,** Rutledge, Tex., Marshall Ford Dam (Invitation A-46908-A); bids in.

250 **Tons,** Indianapolis, Indiana Water Co. plant.

250 **Tons,** Minneapolis, Hall Hevde Co.

200 **Tons,** Minneapolis, Bunge Grain Co. elevator.

200 **Tons,** Minneapolis, Honeywell Regulator Co.

200 **Tons,** Minneapolis, Pillsbury Flour Co. mills.

100 **Tons,** Appleton, Wis., 1,000,000-gal. clear well; bids June 19.

WESTERN STATES

575 **Tons,** Ogden, Utah, Government depot supply building at Hill Field; bids June 27.

295 **Tons,** Davis, Cal., six highway bridges; bids July 3.

200 **Tons,** Billings, Mont., water reservoir.

148 **Tons,** Coyote Wells, Cal., highway work; bids July 5.

Pipe Lines

Texas-New Mexico Pipe Line Co., Hobbs, N. M., plans new 8-in. pressure pipe line from Permian Basin oil field, northern part of Hockey and Cochran Counties, Tex., to point near Midland, Tex., over 50 miles, for crude oil transmission. Connection will be made with main pipe line system of Gulf Oil Co. at later place. Surveys also are under way for a 40-mile extension in new line from junction point near Midland. Proposed to use cast iron, welded joint pipe. H. N. Roberts, Lubbock, Tex., is engineer.

Calcasieu Sulphite Paper Co., Elizabeth, La., has let contract to Latex Construction Co., Alexandria, La., for new welded steel pipe line from gas field near North Eltor, Allen Parish, La., to Elizabeth, for natural gas transmission for service at mill. Booster plant, control station and other operating facilities will be installed.

Montana-Dakota Utilities Co., 831 Second Avenue South, Minneapolis, Minn., plans new welded steel pipe line from point near Fort Peck, Mont., to Glendive, Mont., for natural gas transmission. Booster station and other operating facilities will be installed.

South Penn Oil Co., Bradford, Pa., plans steel pipe lines in connection with development of oil properties in part of Warren County, where new wells will be drilled; also plans steel pipe line gathering system. Entire project to cost over $100,000.

Board of Contract and Supply, Metropolitan District, 550 Main Street, Hartford, Conn., Richard Dillon, clerk, asks bid until June 24 for Barkhamsted-Nepaug and Collinsville bypass pipe lines, including 49½-in. electrically welded steel pipe line, double-dipped in asphalt, from terminus of present steel pipe line near Saville dam, Barkhamsted to point near Cherry Brook, Canton, six and one-half miles in all (Section A); and two similar pipe lines from terminus of new pipe line, Section A, noted under Farmington River to lower gate house at Nepaug dam, New Hartford, about one mile; and from same point to connection with present Nepaug pipe line at Avon, near Collinsville, about three miles, constituting two branches (Section B). New line will be used for main water supply. Alternate bids will be considered for 48-in. reinforced concrete cylinder pipe. Plans and specifications at office of manager and chief engineer of Water Bureau, 1026 Main Street.

Goyer Co., Greenville, Miss., plans two 6-in. and two 3-in. pipe lines in connection with new bulk oil terminal on Mississippi waterfront, for oil transmission to plant.

Cabot Gas Corp., Wellsville, N. Y., operated by Godfrey L. Cabot, Inc., 77 Franklin Street, Boston, plans steel pipe lines in connection with developments in gas field areas in Steuben and Alleghany Counties, N. Y., and Potter and Tioga Counties, Pa., where new wells will be drilled, including pipe lines for connection with present natural gas pipe line transmission system. Entire project to cost in excess of $150,000.

Peoples Gas & Water Co., Meridian, Miss., plans about 19,000 ft. of 6-in. and 7000 ft. of 4-in. pressure pipe lines, for natural gas transmission, extending present system in this vicinity.

Cast Iron Pipe

Hamilton, Va., plans about 10,500 ft. of 8, 6, and 2-in. pipe for water system; also new elevated steel tank and tower. Bids are scheduled to be asked in July. J. B. McCrary Co., Inc., Atlanta, Ga., is consulting engineer.

Jacksonville, Tex., plans pipe line extensions in water system and other waterworks installation, including new filtration plant and 200,000-gal. concrete reservoir. H. L. Thackwell, 209 East Cotton Street, Longview, Tex., is consulting engineer.

Bureau of Yards and Docks, Navy Department, Washington, plans pipe lines and other facilities for water distribution system at new naval air base at Opa Locka, near Miami, Fla. Fund of about $100,000 has been arranged for project.

Readstown, Wis., plans about 10,000 ft. of 6-in. and 600 ft. of 2-in. pipe for extensions in water system, including fittings and specials. Fund of $48,000 has been arranged for this and other waterworks installation. Frank J. Davy & Son, 502 Main Street, La Cross, Wis., are consulting engineers.

United States Engineer Office, Fort Peck, Mont., closes bids June 26 for pipe lines and other facilities for water distribution system (Circular 165).

Seaman, Ohio, plans pipe lines for water system and other waterworks installation. Bond issue of $24,000 is being arranged for municipality's share of cost, with additional funds to be secured through Federal aid.

Public Utility District, Mount Vernon, Wash., plans pipe lines for water system, including main pressure lines for connection with water systems at Sedro-Woolley and Burlington, Wash., and smaller pipe lines for extensions in system in three communities noted; also other waterworks installation. Cost about $230,000. Financing is being arranged through Federal aid. L. R. White is manager of district.

East Point, Ga., plans extensions in water pipe lines, including main supply lines and distribution system; also new 2,000,000-gal. filtration plant, 10,000,000-gal. reservoir and other waterworks installation. Bond issue of $250,000 has been authorized for entire project.

Purchaser of Supplies, San Francisco, will ask bids June 28 for 40,000 ft. of 6-in. Class 150 water pipe (Invitation 2442).

Prices of Finished Iron and Steel...

Steel prices on these pages are f.o.b. basing points (in cents per lb.) unless otherwise indicated. On some products either quantity deductions or quantity extras apply. In many cases gage, width, cutting, physical, chemical extras, etc., apply to the base price. Actual realized prices to the mill, therefore, are affected by extras, deductions, and in most cases freight absorbed to meet competition.

Basing Point → / Product ↓	Pittsburgh	Chicago	Gary	Cleveland	Birmingham	Buffalo	Youngstown	Sparrows Point	Granite City	Middletown, Ohio	Gulf Ports, Cars	Pacific Ports, Cars	DELIVERED TO Detroit	New York	Philadelphia
SHEETS															
Hot rolled	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.20¢	2.10¢		2.65¢	2.20¢	2.34¢	2.27¢
Cold rolled[1]	3.05¢	3.05¢	3.05¢	3.05¢		3.05¢	3.05¢		3.15¢	3.05¢		3.70¢	3.15¢	3.39¢	3.37¢
Galvanized (24 ga.)	3.50¢	3.50¢	3.50¢		3.50¢	3.50¢	3.50¢	3.50¢	3.60¢	3.50¢		4.05¢		3.74¢	3.67¢
Enameling (20 ga.)	3.35¢	3.35¢	3.35¢	3.35¢			3.35¢		3.45¢	3.35¢		4.00¢	3.45¢	3.71¢	
Long ternes[2]	3.80¢		3.80¢									4.55¢			
Wrought iron	4.75¢														
STRIP															
Hot rolled[3]	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢		2.75¢	2.20¢		
Cold rolled[4]	2.80¢	2.90¢		2.80¢			2.80¢	(Worcester = 3.00¢)					2.90¢		
Cooperage stock	2.20¢	2.20¢													
Commodity C-R	2.95¢			2.95¢			2.95¢	(Worcester = 3.35¢)					3.05¢		
TIN PLATE Standard cokes (Per 100-lb. base box)	$5.00	$5.00	$5.00						$5.10						
BLACK PLATE 29 gage[5]	3.05¢	3.05¢	3.05¢						3.15¢			4.05¢ (10)			
TERNES, M'FG Special coated (Per base box)	$4.30		$4.30						$4.40						
BARS															
Soft steel	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢		(Duluth = 2.25¢)			2.50¢	2.80¢	2.25¢	2.49¢	2.47¢
Rail steel[6]	2.05¢	2.05¢	2.05¢	2.05¢	2.05¢	2.05¢					2.40¢	2.70¢			
Reinforcing (billet)[7]	1.90¢	1.90¢	1.90¢	1.90¢	1.90¢	1.90¢	1.90¢	1.90¢			2.25¢	2.30¢	2.00¢		
Reinforcing (rail)[7]	1.80¢	1.80¢	1.80¢	1.80¢	1.80¢	1.80¢	1.80¢				2.15¢	2.20¢	1.90¢		
Cold finished[8]	2.65¢	2.65¢	2.65¢	2.65¢		2.65¢							2.70¢		
PLATES															
Carbon steel	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢	(Coatesville and Claymont = 2.10¢)		2.45¢	2.65¢		2.29¢	2.15¢
Wrought iron	3.80¢														
Floor plates	3.35¢	3.35¢									3.70¢	4.00¢		3.71¢	
SHAPES															
Structural	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢	(Bethlehem = 2.10¢)				2.45¢	2.75¢		2.27¢	2.215¢
SPRING STEEL C-R															
0.26 to 0.50 Carbon	2.80¢			2.80¢			(Worcester = 3.00¢)								
0.51 to 0.75 Carbon	4.30¢			4.30¢			(Worcester = 4.50¢)								
0.76 to 1.00 Carbon	6.15¢			6.15¢			(Worcester = 6.35¢)								
1.01 to 1.25 Carbon	8.35¢			8.35¢			(Worcester = 8.55¢)								
WIRE[9]															
Bright	2.60¢	2.60¢		2.60¢	2.60¢										
Galvanized	2.60¢	2.60¢		2.60¢	2.60¢										
Spring	3.20¢	3.20¢		3.20¢	3.20¢										
PILING															
Steel sheet	2.40¢	2.40¢				2.40¢					2.85¢	2.95¢			
IRON BARS															
Common		2.25¢			(Terra Haute, Ind. = 2.15¢)										
Refined	3.75¢														
Wrought	4.40¢														

[1] Mill run sheets are 10c. per 100 lb. less than base; and primes only, 25c. above base. [2] Unassorted 8-lb. coating. [3] Widths up to 12 in. [4] Carbon 0.25 per cent and less. [5] Applies to 29 gage within certain width and length limitations. [6] For merchant trade. [7] Straight lengths as quoted by distributers. [8] Also shafting. For quantities of 20,000 to 39,999 lb. [9] Carload lots to manufacturing trade. [10] Boxed.

SEMI-FINISHED STEEL

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (Rerolling only). Prices delivered Detroit are $2 higher f.o.b. Duluth, billets only, $2 higher.

	Per Gross Ton
Rerolling	$34.00
Forging quality	40.00

Shell Steel

Basic open hearth shell steel f.o.b. Pittsburgh and Chicago.

	Per Gross Ton
3 in to 8 in.	$54.00
8 in. to 12 in.	52.00
12 in to 18 in.	54.00
18 in. and over	56.00

Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting to length, or quantity. This type of steel is for hot rolled sections used for the making of shells and includes rounds, round squares, and special sections.

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point, Md.

	Per Gross Ton
Open hearth or bessemer	$34.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.90c.

Wire Rods

(No. 5 to 9/32 in.)	*Per Lb.*
Pittsburgh, Chicago, Cleveland	2.00c.
Worcester, Mass.	2.10c.
Birmingham	2.00c.
San Francisco	2.50c.
Galveston	2.25c.

9/32 in. to 47/64 in., $3 a net ton higher. Quantity extras apply.

ROOFING TERNE PLATE

(F.o.b. Pittsburgh; Package, 112 Sheets)

	20x14 in.	20x28 in.
8-lb. coating I.C.	$6.00	$12.00
15-lb. coating I.C.	7.00	14.00
20-lb. coating I.C.	7.50	15.00
25-lb. coating I.C.	8.00	16.00
30-lb. coating I.C.	8.63	17.25
40-lb. coating I.C.	9.75	19.50

WIRE PRODUCTS

(To the Trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham)

	Base per Keg
Standard wire nails	$2.55
Coated nails	2.55
Cut nails, carloads	3.85
	Base per 100 Lb.
Annealed fence wire	$3.05
	Base Column
Woven wire fence*	67
Fence posts (carloads)	69
Single loop bale ties	56
Galvanized barbed wire†	70
Twisted barbless wire	70

*15½ gage and heavier. †On 80-rod spools in carload quantities.

Note: Birmingham base same on above items, except spring wire.

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

	Per Cent Off List
Machine and carriage bolts:	
½ in. and 6 in. and smaller	68½
Larger and longer up to 1 in.	66
1⅛ in. and larger	64
Lag bolts	66
Plow bolts, Nos. 1, 2, 3, and 7	68½
Hot pressed nuts; c.p.c., t-nuts; square, hex., blank or tapped:	
½ in. and smaller	67
9/16 in. to 1 in. inclusive	64
1⅛ in. to 1½ in. inclusive	62
1⅝ in. and larger	60

On above items, excepting plow bolts, additional allowance of 10 per cent for full container quantities.

On all of the above items there is an additional 5 per cent allowance for carload shipments.

Semi-fin. hexagon nuts	U.S.S.	S.A.E.
½ in. and smaller	67	70
9/16 to 1 in.	64	65
1⅛ in. through 1½ in.	62	62
1⅝ in. and larger	60	60

In full container lots, 10 per cent additional discount.

Stove bolts, packages, nuts loose	72½
Stove bolts in packages, with nuts attached, add 15% extra.	
Stove bolts in bulk	83½

On stove bolts freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago, New York, lots of 200 lb. or over.

Large Rivets

(½ in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	$3.40

Small Rivets

(7/16 in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	65 and 10

Cap and Set Screws

	Per Cent Off List
Milled hexagon head, cap screws, 1 in. dia. and smaller	50 and 10
Milled headless set screws, cut thread ¼ in. and larger	64
3/16 in. and smaller	73
Upset hex. head cap screws U.S.S. or S.A.E. thread 1 in. and smaller	70
Upset set screws, cup and oval points	75
Milled studs	52

Freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.

NON-FERROUS PRICES

Cents per lb. for early delivery

	June 12	June 13	June 14	June 15	June 17	June 18
Copper, Electrolytic[1]	11.50	11.50	11.50	11.50	11.50	11.50
Copper, Lake	11.50	11.50	11.50	11.50	11.50	11.50
Tin, Straits, New York	57.25	58.00	58.00	....	56.00	52.50
Zinc, East St. Louis[2]	6.25	6.25	6.25	6.25	6.25	6.25
Lead, St. Louis[3]	4.85	4.85	4.85	4.85	4.85	4.85

[1] Mine producers' quotations only, delivered Conn. Valley. Deduct ¼c. for approximate New York delivery price. [2] Add 0.39c. for New York delivery. [3] Add 0.15c. for New York delivery.

Warehouse Products

Cents per lb., Delivered

	New York	Cleveland
Tin		
Straits pig	54.50	56.50
Copper		
Lake	13.25	12.625
Electro	12.75	12.625
Castings	12.375	12.375
H. R. sheets*	20.12	20.12
Seamless tubes*	20.62	20.62
Brass		
Yellow, sheets*	18.56	18.56
Yellow, rods*	13.55	13.55
Seamless tubes*	21.31	21.31
Zinc		
Slabs	7.60	7.75
Sheets, No. 9 casks	12.00	12.00
Lead		
American pig	6.10	5.50
Bar	8.05	8.25
Cut sheets	8.25	8.25
Antimony		
Asiatic	16.00	17.00
Aluminum		
Virgin, 99%	20.50	21.50
No. 1 remelt., 98-99%	18.00	18.50
Solder		
½ and ½	32.75	32.50
Babbitt		
Anti-friction grade	22.25	22.00

Old Metals

Cents per lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators. Selling prices are those charged to consumers after the metal has been prepared for their use.

	Dealers' Buying Prices	Dealers' Selling Prices
Copper		
Hvy. crucible	9.25	9.875
Hvy. and wire	8.25	8.625
Light and bottoms	7.25	7.75
Brass		
Heavy	5.125	5.625
Light	4.125	4.875
No. 1 yel. turn.	4.50	5.50
No. 1 red or compo. turn	7.75	8.25
Hvy. mach. compo.	8.00	8.625
Lead		
Heavy	4.00	4.375
Aluminum		
Cast	8.50	9.50
Sheet	14.50	15.50
Zinc	3.25	4.00

Miscellaneous Non-Ferrous Prices

ALUMINUM, delivered: virgin, 99 per cent plus, 19c.-20c. a lb.; No. 12 remelt No. 2 standard, 18c.-19c. a lb. NICKEL, electrolytic, 35c.-36c. a lb. base refinery, lots of 2 tons or more. ANTIMONY, prompt: Asiatic, 16.50c. a lb., New York; American, 13c. a lb., f.o.b. smelter. QUICKSILVER, $200-$203 per flask of 76 lb. BRASS INGOTS, commercial 85-5-5-5, 12.25c. a lb.

*These prices, which are also for delivery from Chicago warehouses, are quoted with the following percentages allowed off for extras: on copper sheets, 33⅓; on brass sheets and rods, 40; on brass tubes, 33⅓, and copper tubes, 40.

ALLOY STEEL

Alloy Steel Blooms, Billets and Slabs

Base per gross ton, f.o.b. Pittsburgh, Chicago, Canton, Massillon, Buffalo or Bethlehem.....$54.00

Alloy Steel Bars

Base per pound, f.o.b. Pittsburgh, Chicago, Buffalo, Bethlehem, Massillon or Canton.

Open-hearth grade ..... 2.70c.
Delivered, Detroit ..... 2.80c.

S.A.E. Series Numbers	Alloy Differential, per 100 Lb.
2000 (1.5 Ni)	$0.35
2100 (1.5 Ni)	0.75
2300 (3.5 Ni)	1.55
2500 (5 Ni)	2.25
3100 Ni-Cr	0.70
3200 Ni-Cr	1.35
3300 Ni-Cr	3.80
3400 Ni-Cr	3.20
4100 Cr-Mo (0.15 to 0.25 Mo.)	0.55
4100 Cr-Mo (0.25 to 0.40 Mo.)	0.75
x4340 Cr-Ni-Mo	1.65
4340 Cr-Ni-Mo	1.85
4600 Ni-Mo (0.2-0.3 Mo, 1.5-2 Ni)	1.10
5100 (0.60-0.90 Cr)	0.35
5100 (0.80-1.10 Cr)	0.45
5100 Cr spring steel	0.15
52-100 Cr. (electric furnace)	2.60
6100 Cr-V bar	1.20
6100 Cr-V spring steel	0.85
Cr-Ni-V	1.50
C-V	0.85

The above differentials are for hot rolled finished products. The differential for most grades in electric furnace steel is 50c. higher. Slabs with a section area of 16 in. and 2½ in. thick or over take the billet base.

Alloy Cold-Finished Bars

Base per pound, f.o.b. Pittsburgh, Chicago, Gary, Cleveland or Buffalo, 3.35c. Delivered Detroit, 3.45c., carlots.

STAINLESS AND HEAT-RESISTANT ALLOYS

(Base prices, cents per lb., f.o.b. Pittsburgh)

Chromium-Nickel

No.	304	302
Forging billets	21.25c.	20.40c.
Bars	25.00c.	24.00c.
Plates	29.00c.	27.00c.
Structural shapes	25.00c.	24.00c.
Sheets	36.00c.	34.00c.
Hot rolled strip	23.50c.	21.50c.
Cold rolled strip	30.00c.	28.00c.
Drawn wire	25.00c.	24.00c.

Straight-Chromium

No.	410	430	442	446
Bars	18.50c.	19.00c.	22.50c.	27.50c.
Plates	21.50c.	22.00c.	25.50c.	30.50c.
Sheets	26.50c.	29.00c.	32.50c.	36.50c.
H't strip	17.00c.	17.50c.	24.00c.	35.00c.
C'ld st.	22.00c.	22.50c.	32.00c.	52.00c.

TOOL STEEL

(F.o.b. Pittsburgh)

	Base per Lb.
High speed	67c.
High-carbon-chromium	43c.
Oil-hardening	24c.
Special	22c.
Extra	18c.
Regular	14c.

Prices for warehouse distribution to all points on or East of Mississippi River are 2c. a lb. higher. West of Mississippi quotations are 3c. a lb. higher.

ELECTRICAL SHEETS

(F.o.b. Pittsburgh)

	Base per Lb.
Field grade	3.20c.
Armature	3.55c.
Electrical	4.05c.
Motor	4.95c.
Dynamo	5.65c.
Transformer 72	6.15c.
Transformer 65	7.15c.
Transformer 58	7.65c.
Transformer 52	8.45c.

Silicon strip in coils—Sheet price plus silicon sheet extra width extra plus 25c. per 100 lb. for coils. Pacific ports add 70c. a 100 lb.

CAST IRON WATER PIPE

	Per Net Ton
6-in. and larger, del'd Chicago	$54.80
6-in. and larger, del'd New York	52.20
6-in. and larger, Birmingham	46.00
6-in. and larger f.o.b. dock, San Francisco or Los Angeles or Seattle	56.00

Class "A" and gas pipe, $3 extra; 4-in. pipe is $3 a ton above 6-in. Prices shown are for lots of less than 200 tons. For 200 tons and over, 6-in. and larger is $45 at Birmingham and $53.80 delivered Chicago.

BOILER TUBES

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes. Minimum Wall.

(Net base prices per 100 ft., f.o.b. Pittsburgh, in carload lots)

	Seamless Cold Drawn	Seamless Hot Rolled	Lap Weld, Hot Rolled
1 in. o.d.	13 B.W.G.	$9.01	$7.82	....
1¼ in. o.d.	13 B.W.G.	10.67	9.26	....
1½ in. o.d.	13 B.W.G.	11.70	10.23	$9.72
1¾ in. o.d.	13 B.W.G.	13.42	11.64	11.06
2 in. o.d.	13 B.W.G.	15.03	13.04	12.38
2¼ in. o.d.	13 B.W.G.	16.76	14.54	13.79
2¼ in. o.d.	12 B.W.G.	18.45	16.01	15.16
2½ in. o.d.	12 B.W.G.	20.21	17.54	16.58
2¾ in. o.d.	12 B.W.G.	21.42	18.59	17.54
3 in. o.d.	12 B.W.G.	22.48	19.50	18.35
3½ in. o.d.	11 B.W.G.	28.37	24.62	23.15
4 in. o.d.	10 B.W.G.	35.20	30.54	28.66
4½ in. o.d.	10 B.W.G.	43.04	37.35	35.22
5 in. o.d.	9 B.W.G.	54.01	46.87	44.25
6 in. o.d.	7 B.W.G.	82.93	71.96	68.14

Extras for less carload quantities:

40,000 lb. or ft. over	Base
30,000 lb. or ft. to 39,999 lb. or ft.	5%
20,000 lb. or ft. to 29,999 lb. or ft.	10%
10,000 lb. or ft. to 19,999 lb. or ft.	20%
5,000 lb. or ft. to 9,999 lb. or ft.	30%
2,000 lb. or ft. to 4,999 lb. or ft.	45%
Under 2,000 lb. or ft.	65%

STEEL AND WROUGHT IRON PIPE AND TUBING

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

(F.o.b. Pittsburgh only on wrought iron pipe)

Base Price=$200 Per Net Ton

Butt Weld

Steel	Black	Galv.
⅛ in.	56	36
¼ to ⅜ in.	59	43½
½ in.	63½	54
¾ in.	66½	58
1 to 3 in.	68½	60½

Wrought Iron	Black	Galv.
¼ and ⅜ in.	+9	+30
½ in.	24	6½
¾ in.	30	13
1 and 1¼ in.	34	19
1½ in.	38*	21½
2 in.	37½	21

Lap Weld

Steel		
2 in.	61	52½
2½ and 3 in.	64	55½
3½ to 6 in.	66	57¼
7 and 8 in.	65	55½
9 and 10 in.	64½	55
11 and 12 in.	63½	54

Wrought Iron		
2 in.	30½	15
2½ to 3½ in.	31½	17½
4 in.	33½	21
4½ to 8 in.	32½	20
9 to 12 in.	28½	15

Butt weld, extra strong, plain ends

Steel	Black	Galv.
⅛ in.	54½	41½
¼ to ⅜ in.	56½	45½
½ in.	61½	53½
¾ in.	65½	57½
1 to 3 in.	67	60

Wrought Iron		
¼ and ⅜ in.	+10	+43
½ in.	25	9
¾ in.	31	15
1 to 2 in.	38	22½

Lap weld, extra strong, plain ends

Steel		
2 in.	59	51½
2½ and 3 in.	63	55½
3½ to 6 in.	66½	59

	Black	Galv.
7 and 8 in.	65½	56
9 and 10 in.	64½	55
11 and 12 in.	63½	54

Wrought Iron		
2 in.	33½	18½
2½ to 4 in.	39½	25½
4½ to 6 in.	37½	24
7 and 8 in.	38½	24½
9 to 12 in.	32	20½

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or $2 a ton higher, on all butt weld 8 in. and smaller.

ORES

Lake Superior Ores

Delivered Lower Lake Ports

Per Gross Ton

Old range, bessemer, 51.50%..	$4.75
Old range, non-bessemer, 51.50%	4.60
Mesaba, bessemer, 51.50%....	4.60
Mesaba, non-bessemer, 51.50%	4.45
High phosphorus, 51.50%.....	4.35

Foreign Ores*

C.i.f. Philadelphia or Baltimore, Exclusive of Duty

Per Unit

Algerian, low P, Cu free, dry, 55 to 58% Fe	Nom.
Caucasian, washed, 52% Mn....	Nom.
African, Indian, 44 to 48% Mn..	Nom.
African, Indian, 49 to 51% Mn..	Nom.
Brazilian, 46 to 48% Mn.....	52c.
Cuban, del'd, duty free, 51% Mn.	72c.

Per Short Ton Unit

Tungsten, Chinese, Wolframite, duty paid, delivered.....	$23.50
Tungsten, domestic scheelite, delivered	23.50
Chrome ore, lump c.i.f. Atlantic Seaboard, per gross ton:	
South African (low grade)...	Nom.
Rhodesian, 45%	$24.00
Rhodesian, 48%	28.50

*All foreign ore prices are nominal. War conditions have prevented trading in Swedish and Turkish ores and all quotations have therefore been withdrawn.

RAILS, TRACK SUPPLIES

F.o.b. Mill

Standard rails, heavier than 60 lb., gross ton	$40.00
Angle bars, 100 lb.	2.70

F.o.b. Basing Points

Light rails (from billets), gross ton	$40.00
Light rails (from rail steel), gross ton	39.00

Base per Lb.

Cut spikes	3.00c.
Screw spikes	4.55c.
Tie plates, steel	2.15c.
Tie plates, Pacific Coast	2.30c.
Track bolts, steam railroads	4.15c.
Track bolts, discount to jobbers all sizes (per 100 counts)	65-5

Basing points, light rails—Pittsburgh, Chicago, Birmingham; spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minneaqua, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo; spikes alone—Youngstown, Lebanon, Pa., Richmond, Va.

FLUORSPAR

Per Net Ton

Domestic washed gravel, 85-5, f.o.b. Kentucky and Illinois mines, all rail	$20.00
Domestic, f.o.b. Ohio River landing barges	20.00
No. 2 lump, 85-5 f.o.b. Kentucky and Illinois mines	$20.50 to 21.00
Foreign, 85% calcium fluoride, not over 5% Si., c.i.f. Atlantic ports, duty paid	$25.00 to $25.50
Domestic No. 1 ground bulk, 96 to 98%, calcium fluoride, not over 2½% silicon, f.o.b. Illinois and Kentucky mines	$31.00
As above, in bags, f.o.b. same mines	$32.60

REFRACTORIES

Fire Clay Brick

Per 1000 f.o.b. Works

Super-duty brick, at St. Louis	$60.80
First quality Pennsylvania, Maryland, Kentucky, Missouri and Illinois	47.50
First quality, New Jersey	52.50
Second quality, Pennsylvania, Maryland, Kentucky, Missouri and Illinois	42.75
Second quality, New Jersey	49.00
No. 1 Ohio	39.90
Ground fire clay, per ton	7.10

Silica Brick

Pennsylvania	$47.50
Chicago District	55.10
Birmingham	47.50
Silica cement, net ton (Eastern)	8.55

Chrome Brick

Net per Ton

Standard f.o.b. Baltimore, Plymouth Meeting and Chester	$50.00
Chemically bonded f.o.b. Baltimore, Plymouth Meeting and Chester, Pa.	50.00

Magnesite Brick

Standard f.o.b. Baltimore and Chester	$72.00
Chemically bonded, f.o.b. Baltimore	61.00

Grain Magnesite

Imported, f.o.b. Baltimore and Chester, Pa. (in sacks)	(—)*
Domestic, f.o.b. Baltimore and Chester in sacks	$40.00
Domestic, f.o.b. Chewelah, Wash. (in bulk)	22.00

*None available.

FERROALLOYS

Ferromanganese

F.o.b. New York, Philadelphia, Baltimore, Mobile or New Orleans.

Per Gross Ton

Domestic, 80% (carload).....$120.00

Spiegeleisen

Per Gross Ton Furnace

Domestic, 19 to 21%.....$36.00
Domestic, 26 to 28%..... 49.50

Electric Ferrosilicon

Per Gross Ton, Delivered, Lump Size

50% (carload lots, bulk).....$74.50*
50% (ton lots, packed)..... 87.00*
75% (carload lots, bulk).....135.00*
75% (ton lots, packed).....151.00*

Bessemer Ferrosilicon

Per Gross Ton, F.o.b. Jackson, Ohio

10.00 to 10.50%.....$33.50

For each additional 0.50% silicon up to 12%, 50c. per ton is added. Above 12% add 75c. per ton.

For each unit of manganese over 2%, $1 per ton additional.

Base prices at Buffalo are $1.25 a ton higher than at Jackson.

Silvery Iron

Per Gross Ton, F.o.b. Jackson, Ohio

5.00 to 5.50%.....$27.50

For each additional 0.5% silicon up to 12%, 50c. a ton is added. Above 12% add 75c. a ton.

The lower all-rail delivered price from Jackson or Buffalo is quoted with freight allowed. Base prices at Buffalo are $1.25 a ton higher than at Jackson.

Manganese, each unit over 2%, $1 a ton additional. Phosphorus 0.75% or over, $1 a ton additional.

Ferrochrome

Per Lb. Contained Cr., Delivered Carlots. Lump Size, on Contract

4 to 6% carbon.....11.00c.
2% carbon .....17.50c.
1% carbon .....18.50c.
0.10% carbon .....20.50c.
0.06% carbon .....21.00c.

Spot prices are ¼c. per lb. of contained chromium higher.

Silico-Manganese

Per Gross Ton, Delivered, Lump Size, Bulk, on Contract

3% carbon $113.00*
2.50% carbon 118.00*
2% carbon 123.00*
1% carbon 133.00*

Other Ferroalloys

Ferrotungsten, per lb. contained W, del. carload..... $2.00
Ferrotungsten, 100 lb. and less 2.25
Ferrovanadium, contract, per lb. contained V., del'd $2.70 to $2.90†
Ferracolumbium, per lb. contained columbium, f. o. b. Niagara Falls, N. Y., ton lots ..... $2.25†
Ferrocarbontitanium, 15 to 18% Ti, 7 to 8% C, f.o.b. furnace, carload and contract, per net ton.....$142.50
Ferrocarbontitanium, 17 to 20% Ti, 3 to 5% C, f.o.b. furnace, carload and contract, per net ton.....$157.50
Ferrophosphorus, electric or blast furnace material, in carloads, f.o.b. Anniston, Ala., for 18%, with $3 unitage, freight equalized with Rockdale, Tenn., per gross ton $58.50
Ferrophosphorus, electrolytic 23-26% in carlots, f.o.b. Monsanto (Siglo), Tenn., 24%, per gross ton, $3 unitage, freight equalized with Nashville $75.00
Ferromolybdenum, per lb. Mo, f.o.b. furnace..... 95c.
Calcium molybdate, per lb. Mo, f.o.b. furnace ..... 80c.
Molybdenum oxide briquettes 48-52% Mo, per lb. contained Mo, f.o.b. Langeloth, Pa. 80c.

•Spot prices are $5 per ton higher.
†Spot prices are 10c. per lb. of contained element higher.

FUEL OIL

Per Gal.

No. 3, f.o.b. Bayonne, N. J.....4.75c.
No. 6, f.o.b. Bayonne, N. J.....3.21c.
No. 5 Bur. Stds., del'd Chicago..3.25c.
No. 6 Bur. Stds., del'd Chicago..2.75c.
No. 3 distillate, del'd Cleveland.5.25c.
No. 4 industrial, del'd Cleveland.5.00c.
No. 5 industrial, del'd Cleveland.3.75c.
No. 6 industrial, del'd Cleveland.3.25c.

COKE

Per Net Ton

Furnace, f.o.b. Connellsville, prompt .....$4.00 to $4.25

Foundry, f.o.b. Connellsville, prompt .....$5.25 to 5.50

F'dry, by-product, Chicago.... 10.50

F'dry, by-product, New England 12.50

Foundry, by-product, Newark or Jersey City .....$11.30 to $11.90

F'dry, by-product, Philadelphia 11.13

F'dry, by-product, Cleveland... 11.05

F'dry, by-product, Cincinnati.. 10.50

Foundry, Birmingham 7.50

F'dry, by-product, St. Louis $10.75 to $11.00

Foundry, from Birmingham, f.o.b. cars dock Pacific ports.....$14.75

BRITISH

British

Per Gross Ton, f.o.b. United Kingdom Ports

Ferromanganese, export. £17 18s.

Tin plate, per base box 32s. to 33s.

Steel bars, open hearth 13£ 9s.

Beams, open hearth.... 12£ 2s. 6d.

Channels, open hearth.. 12£ 2s. 6d.

Angles, open hearth.... 12£ 2s. 6d.

Black sheets, No. 24 gage 17£ max.*; 17£ min.**

Galvanized sheets, No. 24 gage 19£ 10s. max.*; 19£ 10s. min.**

*Empire markets only.
**Other than Empire markets.

PIG IRON (Per Gross Ton)

Prices delivered various consuming points indicated by italics

	No. 2 Foundry	Basic	Bessemer	Malleable	Low Phos.
Boston	*$24.50*	*$24.00*	*$25.50*	*$25.00*	.....
Brooklyn	*26.50*	.....	.....	*27.00*	.....
Jersey City	*25.53*	*25.03*	*26.53*	*26.03*	.....
Philadelphia	*24.84*	*24.34*	*25.84*	*25.34*	.....
Bethlehem, Pa.	$24.00	$23.50	$25.00	$24.50	.....
Everett, Mass.	24.00	23.50	25.00	24.50	.....
Swedeland, Pa.	24.00	23.50	25.00	24.50	.....
Steelton, Pa.	.....	23.50	.....	.....	28.50
Birdsboro, Pa.	24.00	23.50	25.00	24.50	28.50
Sparrows Point, Md.	24.00	23.50	.....	.....	.....
Erie, Pa.	23.00	22.50	24.00	23.50	.....
Neville Island, Pa.	23.00	22.50	23.50	23.00	.....
Sharpsville, Pa.	23.00	22.50	23.50	23.00	.....
Buffalo	23.00	22.00	24.00	23.50	28.50
Cincinnati	*23.44*	*23.61*	.....	*24.11*	.....
Canton, Ohio	*24.39*	*23.89*	*24.89*	*24.39*	.....
Mansfield, Ohio	*24.94*	*24.44*	*25.44*	*24.94*	.....
St. Louis	*23.50*	*23.02*	.....	.....	.....
Chicago	23.00	22.50	23.50	23.00	.....
Granite City, Ill.	23.00	22.50	23.50	23.00	.....
Cleveland	23.00	22.50	23.50	23.00	.....
Hamilton, Ohio	23.00	22.50	.....	23.00	.....
Toledo	23.00	22.50	23.50	23.00	.....
Youngstown	23.00	22.50	23.50	23.00	.....
Detroit	23.00	22.50	23.50	23.00	.....
St. Paul	*25.63*	.....	*26.13*	*25.63*	.....
Duluth	23.50	.....	24.00	23.50	.....
Birmingham	19.38*	18.00	24.00	.....	.....
Los Angeles, San Francisco and Seattle	*26.50*	.....	.....	.....	.....
Provo, Utah	21.00	.....	.....	.....	.....
Montreal†	27.50	27.50	.....	28.00	.....
Toronto†	25.50	25.50	.....	26.00	.....

GRAY FORGE

Valley or Pittsburgh fce.....$22.50

CHARCOAL

Lake Superior fce.....$27.00
Delivered Chicago 30.34

Base prices are subject to an additional charge for delivery within the switching limits of the respective districts.

*Delivered prices on Southern iron for shipment to Northern points are 38c. a ton below delivered prices from nearest Northern basing point on iron with phosphorus content of 0.70 per cent and over. †On all grades 2.25 per cent silicon and under is base. For each 25 points of silicon over 2.25 per cent an extra of 25c. is charged.

WAREHOUSE PRICES

(Base Prices, Dollars per 100 lb., Delivered Metropolitan Areas)

	Pittsburgh	Chicago	Cleveland	Philadelphia	New York	Detroit	Buffalo	Boston	Birmingham	St. Louis	St. Paul	Milwaukee	Los Angeles
Sheets, hot rolled	$3.15	$3.05	$3.15	$3.35	$3.38	$3.23	$3.05	$3.51	$3.45	$3.18	$3.30	$3.48	$4.10
Sheets, cold rolled	....	4.10	4.05	4.05	4.40	4.30	4.30	4.58	....	4.12	4.35	4.43	6.30
Sheets, galvanized	4.75	4.60	4.42	4.50	4.30	4.64	4.45	4.66	4.75	4.95	5.00	4.98	5.25
Strip, hot rolled	3.40	3.40	3.30	3.75	3.76	3.48*	3.62	3.86	3.70	3.52	3.65	3.73	....
Strip, cold rolled	3.20	3.30	3.20	3.31	3.31	3.20	3.22	3.26	....	3.41	3.63	3.54	....
Plates	3.40	3.55	3.40	3.55	3.76	3.60	3.62	3.85	3.35	3.47	3.80	3.68	4.00
Structural shapes	3.40	3.55	3.58	3.55	3.75	3.65	3.40	3.85	3.55	3.47	3.80	3.68	4.00
Bars, hot rolled	3.35	3.50	3.25	3.85	3.84	3.43	3.35	3.98	3.50	3.62	3.75	3.63	4.15
Bars, cold finished	3.65	3.75	3.75	4.06	4.09	3.80	3.75	4.13	4.43	4.02	4.34	3.88	6.60
Bars, ht. rld. SAE 2300	7.20	7.10	7.30	7.31	7.35	7.42	7.10	7.50	....	7.47	7.45	7.33	9.40
Bars, ht. rld. SAE 3100	5.75	5.65	5.85	5.86	5.90	5.97	5.65	6.05	....	6.02	6.00	5.88	8.55
Bars, cd. drn. SAE 2300	8.15	8.15	8.15	8.56	8.59	8.45	8.15	8.63	....	8.52	8.84	8.38	10.65
Bars, cd. drn. SAE 3100	6.75	6.75	6.75	7.16	7.19	7.05	6.75	7.23	....	7.12	7.44	6.98	9.80

BASE QUANTITIES: Hot rolled sheets, cold rolled sheets, hot rolled strip, plates, shapes and hot rolled bars, 400 to 1999 lb.; galvanized sheets, 150 to 1499 lb.; cold rolled strip, extras apply on all quantities; cold finished bars, 1500 lb. and over; SAE bars, 1000 lb. and over. Exceptions: Chicago, galvanized sheets, 500 to 1499 lb.; Philadelphia, galvanized sheets, one to nine bundles, cold rolled sheets, 1000 to 1999 lb.; Detroit, galvanized sheets, 500 to 1499 lb.; Buffalo, cold rolled sheets, 500 to 1500 lb., galvanized sheets, 450 to 1499 lb.; Boston, cold rolled and galvanized sheets, 450 to 3749 lb.; Birmingham, hot rolled sheets, strip and bars, plates and shapes, 400 to 3999 lb., galvanized sheets, 500 to 1499 lb.; St. Louis, cold rolled sheets, 400 to 1499 lb., galvanized sheets, 500 to 1499 lb.; Milwaukee, cold rolled sheets, 400 to 1499 lb., galvanized sheets, 150 to 499 lb.; New York, hot rolled sheets, 0 to 1999 lb., cold rolled sheets, 400 to 1499 lb.; St. Paul, galvanized and cold rolled sheets, any quantity, hot rolled bars, plates, shapes, hot rolled sheets, 400 to 14,999 lb.; Los Angeles, hot rolled sheets, bars, plates, shapes, cold rolled sheets, 300 to 1999 lb., galvanized sheets, 150 to 1049 lb. Extras for size, quality, etc., apply on above quotations. *12 gage and heavier, $3.23.

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North Atlantic

● **Continental Can Co.,** 100 East Forty-second Street, New York, has let general contract to Austin Co., Cleveland, for one-story addition to branch plant at Houston, Tex., to double present capacity. Cost over $1,500,000 with equipment.

Schaefer Brewing Corp., 430 Kent Avenue, Brooklyn, has let general contract to Turner Construction Co., 420 Lexington Avenue, New York, for three-story addition, 142 x 200 ft., for new mechanical-bottling works. Cost close to $500,000 with equipment, Eggers & Higgins, 542 Fifth Avenue, New York, are architects.

Consolidated Edison Co. of New York, 4 Irving Place, has filed plans for new one-story pumping station at East River and Hunts Point Avenue. E. L. Griffith is company architect.

Air Associates, Inc., Garden City, Long Island, N. Y., airplane parts and equipment, has let general contract to Austin Co., Cleveland, for new one and two-story and basement plant at Bendix, N. J., larger part of structure to be used for manufacture and remainder for storage and distribution. Cost close to $300,000 with equipment, instead of smaller sum previously noted.

Vanadium Corp. of America, Inc., 420 Lexington Avenue, New York, has let contract to Stearns-Roger Mfg. Co., Denver, Colo., for modernizing and expanding former rare metals mill at Naturita, near Montrose, Colo. New equipment will be installed. Cost over $75,000 with machinery.

Planta Corp., 9 Rockefeller Plaza, New York, has taken over stone quarries in Connecticut, at Niantic, Tylerville, Stony Creek and in vicinity of Middletown and Hartford, respectively, and plans expansion and improvements for early resumption of operations. Large pulverizing and stone-crushing plant is planned at Stony Creek, and a smaller similar unit with 600-ton concrete-mixing plant at Niantic; another concrete-mixing plant is planned at properties near Hartford. Cost over $500,000 with machinery.

Curtiss-Wright Corp., 30 Rockefeller Plaza, New York, airplanes and parts, has plans for new one-story plant, including boiler house, at Caldwell Township, Caldwell, N. J., for Curtiss-Wright Propeller Division. Cost over $150,000 with equipment. Albert Kahn, Inc., New Center Building, Detroit, is architect and engineer.

National Biscuit Co., 449 West Fourteenth Street, New York, will begin superstructure at once for new one and two-story baking plant, 214 x 435 ft., at Denver, for which general contract has been let to William Tamminga, Tramway Building, Denver. Cost close to $1,000,000 with traveling ovens, conveyors and other equipment. Louis Wirsching, first noted address, is company architect.

Commanding Officer, Ordnance Department, Picatinny Arsenal, near Dover, N. J., asks bids until June 26 for 20 tanks for solvent recovery service (Circular 1577); until June 27 for reworking 62,852 lb. of aluminum turnings and scrap (Circular 1582).

Leeds & Northrup Co., 4901 Stenton Avenue, Philadelphia, electric measuring instruments, parts and other precision equipment, has asked bids on general contract for one-story addition. Cost over $50,000 with equipment. Richard Erskine, 1718 Cherry Street, is architect.

Carpenter Steel Co., Reading, Pa., has asked bids on general contract for one-story mill addition at West Shore plant for expansion in wire-manufacturing division. Cost close to $200,000 with machinery. Muhlenberg, Yerkes & Muhlenberg, Ganster Building, are architects. Company has work under way on addition to tube mill, to cost over $300,000 with equipment.

Commanding Officer, Ordnance Department, Frankford Arsenal, Bridesburg, Philadelphia, asks bids until June 27 for telescope mounts, range quadrants, spare parts, sighting equipment for 105-mm. howitzer carriage, etc. (Circular 1630).

Buffalo District

● **Oneida Community, Ltd.,** Sherrill, N. Y., plated wares, animal traps, etc., has approved plans for one-story addition, 50 x 300 ft. Cost over $75,000 with equipment. E. D. Pitt is company engineer.

Fedders Mfg. Co., 57 Tonawanda Street, Buffalo, automobile radiators, unit heaters, air-conditioning equipment, etc., is making extensions and improvements in production equipment and facilities to handle munition orders. Considerable new equipment will be installed.

State Department of Mental Hygiene, State Office Building, Albany, N. Y., asks bids until June 26 for new power plant at State hospital at Binghamton, N. Y. Cost close to $800,000 with equipment. T. F. Farrell is chief engineer.

Canada

● **Canadian Associated Aircraft, Ltd.,** Toronto, airplanes and parts, with plant at municipal airport at Malton, has begun work on one-story addition, 133 x 260 ft., forming a third bay at works, for expansion in assembling division. Cost close to $100,000 with machinery.

Canadian Car & Foundry Co., Ltd., Montreal, in cooperation with Dominion Government, Ottawa, Ont., will prepare plans at once for new shell-manufacturing and shell-filling plant. Cost about $8,000,000 with machinery. Both British and French Governments are interested in project, and part of financing will come from these sources.

Cub Aircraft, Ltd., Adam Street, Hamilton, Ont., airplanes and parts, has let general contract to Pigott Construction Co., Ltd., Pigott Building, for one-story addition, 100 x 125 ft., with smaller adjoining unit. Cost about $80,000 with equipment, instead of smaller sum previously noted. Prack & Prack, 36 James Street South, are architects.

White Canadian Aircraft, Ltd., Toronto, has appointed Russell Crooks, chief engineer, and plans to spend $300,000 for addition to plant and new equipment.

Duplate Tool & Die Co., Ltd., has leased 8000 sq. ft. of floor space in Heintzman Building, Heintzman Avenue, Toronto, for production of tools, dies and for a general machine shop.

Ottawa Aircraft, Ltd., 301 Slater Street, Ottawa, Ont., has awarded several sub-trades in connection with plant addition on Bowesville Road, to cost $60,000. Dorant Construction Co., Ltd., 78 Bank Street, has general contract.

Cornwall Street Railway Co., Cornwall, Ont., plans expansion to include new machine shops, power station, laying of new tracks, etc.

Beauharnois Power Corp., Ltd., 107 Craig Street, West, Montreal, has received tenders and plans to start work at once on power development project at Beauharnois, Que., to cost $5,000,000.

New England

● **United States Electrical Motors, Inc.,** 200 East Slauson Avenue, Los Angeles, will take bids soon for new Eastern branch plant at Milford, Conn., consisting of main one-story unit, 200 x 220 ft., and power house adjoining. Cost close to $100,000 with equipment. Leo F. Caproni, 1221 Chapel Street, New Haven, Conn., is architect and engineer.

Florence Stove Co., Gardner, Mass., oil and gas stoves, parts, etc., has let general contract to Donald D. Snyder, Inc., 36 Comee Street, for two-story and basement addition. Cost close to $50,000 with equipment.

New Britain Machine Co., New Britain, Conn., has let general contract to Morton C. Tuttle Co., Park Square Building, Boston, for one-story addition, 100 x 240 ft. Cost close to $85,000 with equipment.

Brown & Sharpe Mfg. Co., Providence, R. I., machine tools and parts, has asked bids on general contract for one-story addition, 75 x 260 ft., with extension about 90 x 100 ft. Cost over $100,000 with equipment.

South Atlantic

● **Commanding Officer,** Ordnance Department, Augusta Arsenal, Augusta, Ga., asks bids until June 24 for one hydraulic press, not less than 60 tons capacity, and one motor-driven, two-stage, garage-type air compressor (Circular 54), electric hoist, with drum parallel to running beam (Circular 55); until June 25, steel shop equipment, including shelving, racks, etc., for Fort Oglethorpe, Ga. (Circular 57); until June 26, wood boring machine (Circular 56), and vertical milling machine (Circular 58), both motor-driven.

Monroe Coca-Cola Bottling Co., Monroe, Ga., will ask bids soon on general contract for new one-story mechanical-bottling, storage and distributing plant. Cost over $75,000 with equipment. F. P. Smith, Norris Building, Atlanta, Ga., is architect.

Washington District

● **Purchasing and Contracting Officer,** Holabird Quartermaster Depot, Baltimore, asks bids until June 24 for lathes, jacks, motor-driven shears, pumps, steel storage bins, motor-driven cylinder boring machines, blowers, motors, sheet metal-working machines, hoists, paint guns, tanks, pliers and other tools (Circular 398-232).

Samuel Kirk & Son, Inc., Twenty-fifth Street and Kirk Avenue, Baltimore, manufacturer of silverware and plated ware products, has let general contract to Cogswell Construction Co., 405 Park Avenue, for one-story addition. Cost close to $40,000 with equipment.

Bureau of Yards and Docks, Navy Department, Washington, is securing fund of about $2,000,000 in new naval air base appropriation bill, passed by Congress, for new buildings and equipment at Tongue Point, Ore., including two one-story extensions to shop and storehouse buildings, cost about $150,000 with equipment; motor-test shop, $40,000 with equipment; seaplane hangar, $46,000; gasoline storage tanks, capacity about 400,000 gal.; about 5000 gal. fuel storage tanks; bombing storage and shop unit, $30,000; torpedo storage building, $45,000; shop and maintenance building, $60,000 with equipment, and other structures.

Quartermaster, U. S. Marine Corps, Navy Building, Washington, asks bids until June 25 for one universal milling machine (Schedule 1952), woodworking lathe (Schedule 1941), and one scroll saw (Schedule 1940).

State Hospital Board, Richmond, Va., plans extensions and improvements in steam power plant at Southwestern State Hospital, Marion, Va., including additional equipment. Work will be carried out in connection with other expansion at institution. Fund of about $160,000 has been authorized for entire project.

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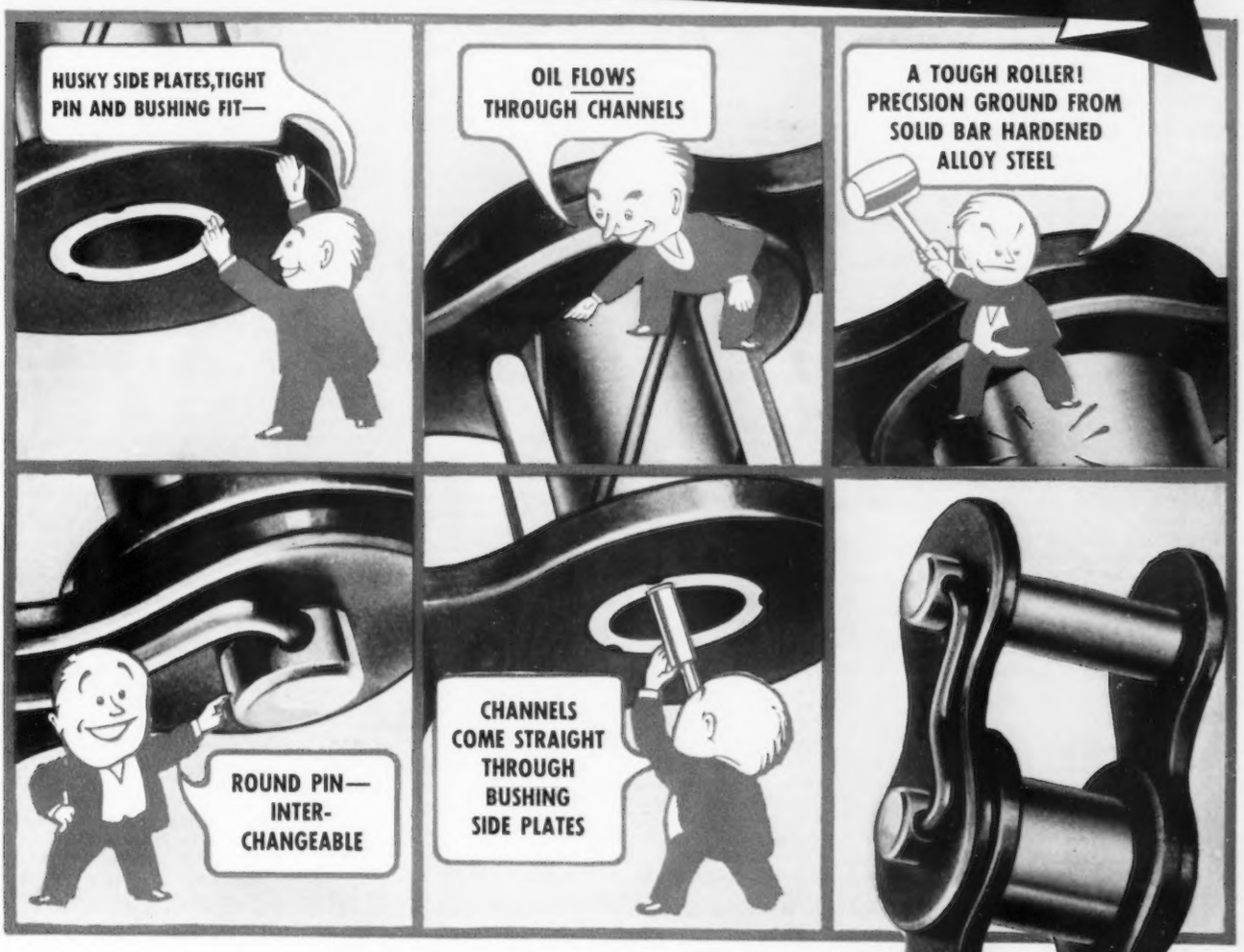

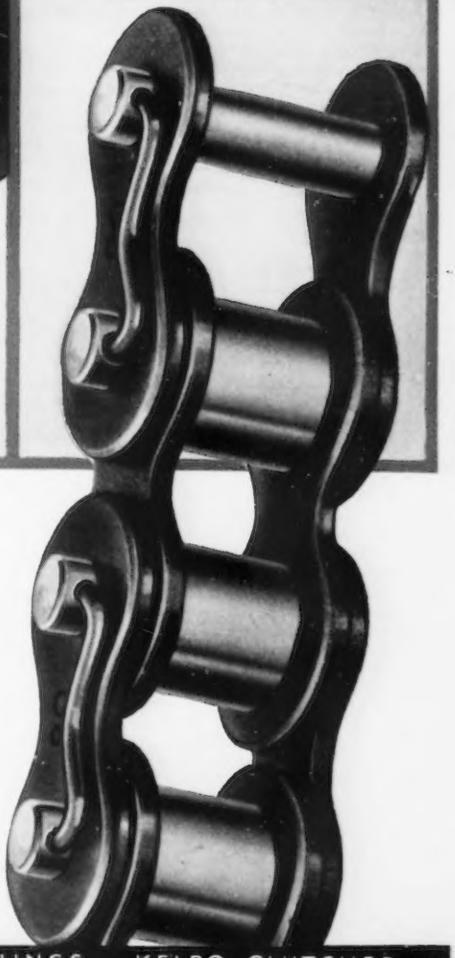

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Chemical Warfare Service, Edgewood Arsenal, Edgewood, Md., asks bids until June 24 for steel surface cabinets, guy clamps, couplings, cable, locknuts, wire, bolts, bushings and other equipment (Circular 781).

General Purchasing Officer, Panama Canal, Washington, asks bids until June 26 for one diesel engine caterpillar-tread tractor, with trail builder (Schedule 4110); until June 27, one 20,000-bbl. cylindrical steel tank, all-welded construction, for gasoline storage (Schedule 4107).

South Central

● **Lion Oil Refining Co.,** Exchange Building, Eldorado, Ark., plans new bulk oil storage and distributing plant on river front at Memphis, Tenn., consisting of several one-story buildings, pumping station, steel tank storage units and distribution facilities for initial capacity of 2,500,000 gal., and miscellaneous structures. Cost over $100,000 with equipment.

Constructing Quartermaster, Southeast Air Depot, Mobile, Ala., asks bids until July 9 for one 300,000-gal. elevated steel water tank and tower for Southeast air station.

Tennessee Powder Co., Knoxville, Tenn., care of J. M. Burnett, Jr., Hamilton Bank Building, Knoxville, incorporator, recently organized, is securing about 5000 acre tract near Memphis, Tenn., for new smokeless powder plant, to be designed, constructed and operated by E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., under contract. It will comprise over 80 one and multi-story buildings, including chemical works, mechanical shops, magazine structures, power house, water-pumping station and other buildings. Cost close to $12,000,000 with equipment. British Purchasing Commission, office of British Consulate, 25 Broadway, New York, is interested in project.

Southwest

● **Beech Aircraft Corp.,** Wichita, Kan., airplanes and parts, has purchased about 150 acres, adjoining, for expansion, including one-story additions for parts production and assembling. Plans are being completed for initial one-story unit, about 42,000 sq. ft. of floor space, for storage, hangar and shop service. Other structures will be built soon. Entire project will cost over $100,000.

A. Leschen & Sons Rope Co., 5909 Kenerly Avenue, St. Louis, wire rope, cables, etc., has let general contract to Fruin-Colnon Contracting Co., Merchants' Laclede Building, for one-story addition, 35 x 150 ft. Cost over $65,000 including traveling crane and other mechanical-handling equipment. Hugo K. Graf, 2825 Olive Street, is architect.

City Council, Iola, Kan., plans extensions and improvements in municipal power plant, including additional equipment. Cost over $60,000 with equipment. E. T. Archer & Co., New England Building, Kansas City, Mo., are consulting engineers.

Philadelphia Quartz Co., 4238 Geraldine Avenue, St. Louis, chemical products, etc., has let general contract to Fruin- Colnon Contracting Co., Merchants' Laclede Building, for one-story addition for raw material processing and other service. Cost over $45,000 with equipment. Main offices are in Philadelphia.

Texas Gypsum Mining & Construction Co., Hempstead, Waller County, Tex., D. S. Culberson, Hempstead, company official, in charge, recently organized, plans development of gypsum mining properties near place noted, where 7500 acres has been leased. Company will sink two shafts for initial production, and install electric-operated mining machinery, shovels, drag lines, conveyors, loaders and other equipment. Cost about $100,000. Output will be used for production of wall board under a new process, and a mill will be built for this purpose in same district, to include processing and production units, storage and distributing buildings, power house, machine shop and other structures. Cost close to $200,000 with machinery. Charles A. Howe will be president.

Western Pa. District

● **Latrobe Foundry, Machine & Supply Co.,** Latrobe, Pa., iron castings, machine parts, etc., has approved plans for one-story addition, about 80 x 90 ft., for foundry expansion. Cost close to $40,000 with equipment.

Aluminum Co. of America, Inc., Gulf Building, Pittsburgh, is arranging for early reopening of branch casting plant at Buffalo, idle for eight years, and is modernizing and installing new equipment and facilities for production of magnesium alloy castings for aircraft, to which line plant will be given over. Cost over $400,000 with equipment. Plant will be operated by American Magnesium Corp., Cleveland, in future, an affiliated interest.

Royal Mfg. Co., 19 North First Street, Duquesne, Pa., mineral oil products, plans new oil refinery at Warren, Pa., consisting of two two-story structures and six one-story buildings. Cost close to $100,000 with equipment. Bids will be asked in about 60 days.

Ohio and Indiana

● **Lees-Bradner Co.,** 6210 Carnegie Avenue, Cleveland, machine tools and parts, has acquired former plant of Smith Incubator Co., West 121st Street and Elmwood Avenue, consisting of four-acre tract, with building units of about 62,000 sq. ft. floor space. New owner will modernize for new plant, with equipment installation to include overhead craneway and other mechanical-handling facilities. Cost over $75,000 with equipment. Ernest McGeorge, East Ninety-third Street and Quincy Avenue, is consulting engineer.

Constructing Quartermaster, Wright Field, Dayton, Ohio, asks bids until June 26 for pumping station, including deep-well turbine pumping units and accessories (Circular 6681-44).

City Auto Stamping Co., Lint Avenue, Toledo, Ohio, has asked bids on general contract for one-story addition, about 80,000 sq. ft. of floor space, for die division, now occupying leased space. Cost close to $500,000 with equipment. Albert Kahn, Inc., New Center Building, Detroit, is architect and engineer.

Hooven & Allison Co., Huit Street, Xenia, Ohio, rope and cordage products, plans new power house, installation to include two diesel engine-generator units, oil tanks, pumps and auxiliary equipment. Carl J. Kiefer, Inc., Schmidt Building, Cincinnati, Ohio, is consulting engineer.

Sunbeam Electric Mfg. Co., Read Street and Morgan Avenue, Evansville, Ind., automobile headlights, etc., has asked bids on general contract for two and three-story addition, 89 x 142 ft. Cost over $125,000 with equipment. Edwin C. Berendes, 121 Upper Fourth Street, is architect.

Michigan District

● **American Metal Products Co.,** 5959 Linsdale Avenue, Detroit, welded steel tubing and kindred products, has let general contract to Bryant & Detwiler Co., Penobscot Building, for one-story addition. Cost close to $50,000 with equipment. Giffels & Vallet, Inc., L. Rossetti, Marquette Building, are architects and engineers.

Dow Chemical Co., Midland, Mich., industrial chemicals, etc., has approved plans for one-story addition to Dowmetal plant at Bay City, Mich., 80 x 200 ft., for expansion in core-making and molding of magnesium alloys. Work will begin early in July. Cost close to $100,000 with equipment. Company has let general contract to Austin Co., Cleveland, for two-story and basement addition to Midland plant, about 400,000 sq. ft. of floor space for office and other operating service. Cost over $450,000 with equipment.

Middle West

● **Chicago Forging & Mfg. Co.,** 2000 Southport Avenue, Chicago, has let general contract to William J. Scown Building Co., 54 West Randolph Street, for two-story addition, 100 x 109 ft. Cost over $65,000 with equipment. Allen & Webster, 225 North Michigan Avenue, are architects.

Ingersoll Steel & Disc Division, Borg-Warner Corp., 310 South Michigan Avenue, Chicago, steel products, steel containers, etc., has let general contract to Miller-Davis Co., Kalamazoo, Mich., for one-story addition to branch plant at Kalamazoo. Cost close to $50,000 with equipment.

Allen-Bradley Co., 1326 South Second Street, Milwaukee, electric control devices and electrical equipment, will take bids soon on general contract for four-story addition, 90 x 125 ft., with foundations for additional stories later. Cost over $100,000 with equipment. Fitzhugh Scott, 724 East Mason Street, is architect.

City Council, Denison, Iowa, asks bids until June 24 for one 1500-kw. turbine-generator unit, exciter, surface condenser and auxiliary equipment for municipal power plant, where expansion and improvements will be carried out.

City Council, Hastings, Neb., has authorized expansion and improvements in municipal power plant, including multi-story addition and installation of equipment. Latter will include overhead crane in main station for turbine maintenance. Cost close to $150,000. Black & Veatch, 4706 Broadway, Kansas City, Mo., are consulting engineers.

Sun Mfg. Co., 3012 North Clybourn Avenue, Chicago, electrical products for automobiles, will take bids soon on general contract for new one-story plant, 100 x 185 ft., on Avondale Avenue. Cost close to $65,000 with equipment. W. P. McCaughey, 3 South Prospect Avenue, Park Ridge, Ill., is architect.

Pacific Coast

Thornton Canning Co., Thornton, Cal., canned food products, has let general contract to F. R. Siegrist, 604 Mission Street, San Francisco, for one-story addition, 80 x 275 ft., for storage and distribution. Cost close to $50,000 with equipment. W. H. Ellison, Pacific Building, San Francisco, is architect and engineer.

Boeing Aircraft Corp., Seattle, will install a straight-line production plant in new one-story addition, about 577,000 sq. ft. floor space, including drop hammer and press divisions, sheet metal department, welding works, jig shop, sub-assembling department on a second floor running for a section in center of building, machine shops and main assembling works. Installation will include electric traveling cranes, hoists, conveyors, factory trucks and tractors, and other equipment. Superstructure is scheduled to begin soon by Austin Co., Seattle, which recently secured general contract. Cost about $2,000,000 with machinery.

Bureau of Yards and Docks, Navy Department, Washington, plans new aircraft engine shop for maintenance, repairs and parts production at Sand Point Naval Air Station, Seattle. Cost about $400,000 with equipment. Also will build new hydroplane hangar at station with shop and reconditioning facilities. Cost about $450,000 with equipment.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until June 25 for precision bench lathe (Schedule 1944), universal miller, duplex type, with attachments (Schedule 1952), high-speed band scroll saw (Schedule 1940), general purpose lathe (Schedule 1943), woodworking lathe, motor-in-head type (Schedule 1941), 24-in. rapid traverse shaper, with universal table (Schedule 1953), all motor-driven, for Alameda, Cal., Naval Air Station.